

# Amateur Radio

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**THE RADIO AMATEUR'S JOURNAL**



# KENWOOD

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**NEW!**  
Computer Interface

## "DX-cellence!"

### TS-940S

The new TS-940S is a serious radio for the serious operator. Superb interference reduction circuits and high dynamic range receiver combine with superior transmitter design to give you no-nonsense, no compromise performance that gets your signals through! The exclusive multi-function LCD sub display graphically illustrates VBT, SSB slope, and other features.

#### • 100% duty cycle transmitter.

Super efficient cooling system using special air ducting works with the internal heavy-duty power supply to allow continuous transmission at full power output for periods exceeding one hour.

#### • High stability, dual digital VFOs.

An optical encoder and the flywheel VFO knob give the TS-940S a positive tuning "feel."

#### • Graphic display of operating features.

Exclusive multi-function LCD sub-

display panel shows CW VBT, SSB slope tuning, as well as frequency, time, and AT-940 antenna tuner status.

#### • Low distortion transmitter.

Kenwood's unique transmitter design delivers top "quality Kenwood" sound.

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#### • QRM-fighting features.

Remove "rotten QRM" with the SSB slope tuning, CW VBT, notch filter, AF tune, and CW pitch controls.

#### • Built-in FM, plus SSB, CW, AM, FSK.

#### • Semi or full break-in (QSK) CW.

#### • 40 memory channels.

Mode and frequency may be stored in 4 groups of 10 channels each.

#### • Programmable scanning.

#### • General coverage receiver.

Tunes from 150 kHz to 30 MHz.

#### • 1 yr. limited warranty.

Another Kenwood First!

#### Optional accessories:

• AT-940 full range (160-10m) automatic antenna tuner • SP-940 external



Interface IF-232C/IF-10B

speaker with audio filtering • YG-455C-1 (500 Hz), YG-455CN-1 (250 Hz), YK-88C-1 (500 Hz) CW filters; YK-88A-1 (6 kHz) AM filter • VS-1 voice synthesizer • SO-1 temperature compensated crystal oscillator • MC-43S UP/DOWN hand mic. • MC-60A, MC-80, MC-85 deluxe base station mics. • PC-1A phone patch • TL-922A linear amplifier • SM-220 station monitor • BS-8 pan display • SW-200A and SW-2000 SWR and power meters.



Complete service manuals are available for all Trio-Kenwood transceivers and most accessories. Specifications and prices are subject to change without notice or obligation.



More TS-940S information is available from authorized Kenwood dealers.

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NEW

## Hear it All!

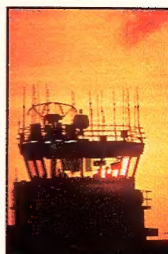


### R-5000

#### High performance receiver

**THE** high performance receiver is here from the leader in communications technology—the Kenwood R-5000. This all-band, all mode receiver has superior interference reduction circuits, and has been designed with the highest performance standards in mind. Listen to foreign music, news, and commentary. Tune in local police, fire, aircraft, weather, and other public service channels with the VC-20 VHF converter. All this excitement and more is yours with a Kenwood R-5000 receiver!

- **Covers 100 kHz-30 MHz in 30 bands, with additional coverage from 108-174 MHz (with VC-20 converter installed).**
- **Superior dynamic range.** Exclusive Kenwood DynaMix™ system ensures an honest 102 dB dynamic range. (14 MHz, 500 Hz bandwidth, 50 kHz spacing.)



- **100 memory channels.** Store mode, frequency, antenna selection.
- **Voice synthesizer option.**
- **Computer control option.**
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- **Kenwood's superb interference reduction.** Optional filters further enhance selectivity. Dual noise blankers built-in.
- **Direct keyboard frequency entry.**

- **Versatile programmable scanning, with center-stop tuning.**
- **Choice of either high or low impedance antenna connections.**
- **Kenwood non-volatile operating system.** Lithium battery backs up memories; all functions remain intact even after lithium cell expires.
- **Power supply built-in.** Optional DCK-2 allows DC operation.
- **Selectable AGC, RF attenuator, record and headphone jacks, dual 24-hour clocks with timer, muting terminals, 120/220/240 VAC operation.**

#### Optional Accessories:

- VC-20 VHF converter for 108-174 MHz operation
- YK-88A 1.6 kHz AM filter
- YK-88S 2.4 kHz SSB filter
- YK-88SN 1.8 kHz narrow SSB filter
- YK-88C 500 Hz CW filter
- YK-88CN 270 Hz narrow filter
- DCK-2 DC power cable
- HS-5, HS-6, HS-7 headphones
- MB-430 mobile bracket
- SP-430 external speaker
- VS-1 voice synthesizer
- IF-232C/IC-10 computer interface.

More information on the R-5000 and R-2000 is available from Authorized Kenwood Dealers.

### R-2000

150 kHz-30 MHz in 30 bands

- All modes
- Digital VFOs tune in 50 Hz, 500 Hz, or 5 kHz steps
- 10 memory channels
- Programmable scanning
- Dual 24-hour digital clocks, with timer
- 3 built-in IF filters (CW filter optional)
- All mode squelch, noise blanker, RF attenuator, AGC switch, S meter
- 100/120/220/240 VAC operation
- Record, phone jacks
- Muting terminals
- VC-10 optional VHF converter (108-174 MHz)



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### TH-205AT

**Affordable 5-watt hand-held transceiver. Ultimate Affordability!**

It's here now! The affordable, "Kenwood Quality" hand-held transceiver. Standard features include a large, easy-to-read LCD display, wide-range power requirements (operates on 7.2 VDC—16 VDC), 3-channel memory, built-in battery saver circuit, and, when operated on 12 VDC, a robust five watts of power! The die-cast metal rear panel/heat sink assures cool, reliable operation. Receiver frequency coverage from 141–163 MHz is also standard—you can even listen to the "weather channels" at 162.40 or 162.55 MHz!

- Monitor switch—to check frequency when PL encode/decode switch is on.
- Extended frequency coverage for certain MARS and CAP operations.
- 3 memory channels store frequency and offset. And so easy to use! Simply press the memory channel number to recall your favorite channels!
- Night light, offset/reverse.
- 16-key DTMF pad for repeater autopatch is standard.



- NEW! Twist-Lok Positive-Connect™ battery case. A wide range of quick-change commercial duty battery packs are available.

- 12 VDC input terminal—allows direct mobile or external power supply operation. When 12 VDC is applied, power output increases to **5 watts!**

- Heavy-duty final amplifier and heat sink. The die-cast rear panel assures reliable operation. With the optional 12-volt PB-1 battery pack, the TH-205AT provides 5 W output. The standard 8.4 volt PB-2 provides 2.5 W output. (300 mW low power).

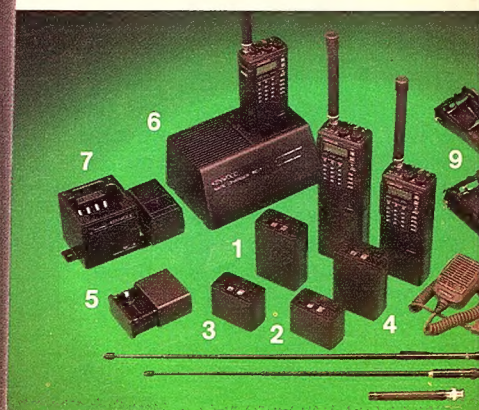
- Large, easy-to-read LCD display. Frequency, offset, memory channel, TX, RX, and battery indicator.

- Frequency UP/DOWN keys. Used to select frequency or scanning direction.

- Scan function key.

- Automatic battery saver circuit extends battery life. No buttons to push!

- Supplied accessories include: Rubber flex antenna, belt hook, 8.4 V, 500 mAh NiCd battery pack, wall charger.



#### Optional Accessories:

- 1) PB-1 12 V 800 mAh NiCd batt. pack (5 W output).
- 2) PB-2 8.4 V 500 mAh NiCd batt. pack (2.5 W output).
- 3) PB-3 7.2 V 800 mAh NiCd batt. pack (1.5 W output).
- 4) PB-4 7.2 V 1600 mAh NiCd batt. pack (1.5 W output).
- 5) BT-5 AA manganese/alkaline battery case.
- 6) BC-7 Rapid charger for PB-1, 2, 3, or 4.
- 7) BC-8 Battery charger for PB-1, 3 or 4.
- 8) SMC-30 Speaker microphone.
- 9) SC-12, SC-13 Soft cases.
- 10) RA-3, RA-5 Telescoping antennas.
- 11) RA-8B StubbyDuk antenna • TSU-3 CTCSS encode/decode unit • VB-2530 2 m, 25 W RF power booster • LH-4, LH-5 Leather cases • MB-4 Mobile bracket • BH-5 Swivel mount • PG-2V DC cable • PG-3C Filtered cigar lighter cord.

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**The Radio  
Amateur's Journal**



**ON THE COVER:** Speaking of museums, here's Dick Whatham, K2JXU, in costume at the S.B. Morse Museum in Poughkeepsie, New York. Dick is shown with the newest and oldest in radio technology. He's also working packet radio via an HT. Photo by Larry Mulvehill, WB2ZPI, with the cooperation of the Young-Morse Historical Site.

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# Zero Bias

## AN EDITORIAL

**Y**ou'll have to admit that the major pieces of specialized equipment we are reviewing this month are priced beyond the reach of a lot of amateurs. However, with Christmas coming up next month, it doesn't hurt to set your sights high and wish for some really great stuff instead of the usual socks and handkerchiefs. Also, for those among us who can afford it, these "toys" really do separate the men from the boys. For the financially conservative among us who happen to live in states with a sales tax, be reminded that this may also be one of the last chances to write off the sales tax on a big ticket item on this year's income tax return. So it appears, at least fancifully, that there's a lot to "thinking big."

On the other hand, it doesn't follow that getting in on packet radio or RTTY has to cost a bundle either. You can enjoy these modes for a reasonable amount of money or spend to your heart's content. If, however, you want to be the only "kid" on the block with the new XK Zoomer, that does bear a stiffer price. Keep in mind at all times that although some equipment might be thought of as expensive, we don't pay one cent for use of the spectrum. That's sort of like complaining about the price of a car you want to buy when all along the gas is free. How much and how well you want to drive is up to you.

Speaking of bucks, I did hear from a few dealers who said that some of you followed my advice a few months ago and bought imported gear before the prices went up due to the dollar/yen exchange rate changes. Those of you who were smart enough to get in on that should have saved enough to give you a head start on some RTTY or packet gear.

### Change of Heart

We got a lot of response to Tony Byrum, KA0VFN's letter we ran in the September "Our Readers Say" column. As you could have predicted, the responses were all the way from "good riddance" to "what a shame, but I know how he feels." Well, we can all cheer up. Tony upgraded to Technician recently, so we haven't lost him. (See "Our Readers Say" column this month.) Congratulations, Tony. It's good to have you with us.

### A Good Idea

For those of you who are addicted to reading the Ham Shop ads and checking out various east coast hamfest fleamarkets, the name Tony Musero, K3UKW, probably sounds familiar. Tony wrote to me about the September Zero Bias and offered a solution to my query on buying items from fleamarkets and even from classified ads: "How do you know it works?" Along with the letter was a certificate which I assume Tony gives out or would like to see used when selling gear. It's a good idea if used properly.

### A Bad Idea

Most of the talk at the recent ARRL National Convention in San Diego was about the proposed new ARRL museum/meeting-room complex. The anticipated cost of \$2.7 million caught most people the same way—what a waste. At a time when everyone is looking for ways to increase the amateur population virtually without funds, upwards of \$3,000,000 is being sought to build what I called a mausoleum. Part of the money is supposed to come from state aid or grants, but the bulk of the cash will no doubt be urged from members. It's hard to go back and ask these members to give some more so that amateur radio can grow when they've just kicked in for a museum. If you consider that of the approximately 130,000 members who exist about 25,000 plus are life members (that translates to no more dollars from them) and a good portion are also senior citizens (reduced membership rates, presumably less income), that leaves the rest to kick in the money. The money can and should be spent to build amateur radio, to also ensure that there will be an amateur radio for future generations.

If you want to see a really great museum, if you really want to get the feel and flavor of radio from the early days, then you don't have to wait at all. In upstate New York, just south of Rochester, in the city of Holcomb stands the Antique Wireless Association's terrific museum.

#### CERTIFICATE OF CONDITION:

EQUIPMENT SOLD/TRADED FROM \_\_\_\_\_ TO \_\_\_\_\_  
(SELLER)

(BUYER) (MFG) (MODEL)

CONDITION OF EQUIPMENT: DATE OF SALE:

ELECTRICAL \_\_\_\_\_ OP'S MANUAL: 0  
MECHANICAL \_\_\_\_\_ ITEMS THAT ARE IN-  
OPERATIONAL \_\_\_\_\_ CLUDED BUT WILL  
PHYSICAL \_\_\_\_\_ BE SENT VIA MAIL:  
IDENTIFY (KNOWN PROBLEM HERE): \_\_\_\_\_

ADDITIONAL REMARKS HERE: \_\_\_\_\_

**PROTECTION IS A MATTER OF TRUST.**

SIGNATURES OF BUYER: \_\_\_\_\_ CALL (IF ANY): \_\_\_\_\_  
" OF SELLER: \_\_\_\_\_ CALL (IF ANY): \_\_\_\_\_

*Tony Musero, K3UKW's certificate to use when selling gear.*

Bruce Kelley, W2ICE, is the curator, and he'll be glad to arrange tours or send you info on the museum or the AWA. If it's tradition and heritage you need, including a full-scale reproduction of an early radio parts store, then contact Bruce. I guarantee it won't cost \$3,000,000 just to talk to him or to have the museum experience. You can contact Bruce at the AWA, Main Street, Holcomb, NY 14469.

If you still think that a museum is more important than new amateurs at this point, and most important if you are a member of the ARRL, then there are at least two possible methods of funding such a folly. One, you could pay for it out of existing funds, funds which now exist in an investment portfolio. Two, you could require all new applications for membership also include membership in an ARRL tontine. I'm sure the insurance company that handles the equipment insurance could also handle a group term life insurance program. Presumably, we all get older, and as the median age for amateurs increases, it won't take too long for the last of us to kick off and thereby supply whatever it costs to build the mausoleum. At that point it would be appropriate. Either way the egocentric, back-patting edifice could be built as a tribute to what was and no longer is.

### A Better Idea

If the ARRL considers it possible to raise several million dollars from its members, then we have to assume it is possible. However, the great majority of licensed amateurs do not belong to the ARRL, and they too might be a source of funds, at least some of them. Then think of the possibility of what that sum could do. Besides promotional and educational literature about amateur radio, it might be possible to underwrite a couple of hundred amateur radio club stations in junior high schools and high schools. Traveling mobile displays of amateur radio could be sent around the country demonstrating what a wonderful pastime amateur radio is and how important it is in aiding one's own community in times of disaster or need. All of the wonderful things that you and I can think up require that one illusive thing to make them happen—money. It's also going to take people—people who want to see these things happen, and people who can make these things happen. Obviously, from assumption at least, the money can be raised. However, I'm afraid that sum of money can't be raised several times over, so the spending of it becomes very, very important.

It's up to us, League members and non-members, to either go for it and work towards grabbing a piece of the future or settle back and accept a temple to the past where we can sit around, warm in our dotage, watching reruns of "Happy Days" and sniffing ozone from the hourly spark display.

73, Alan, K2EEK



# Or This Inexpensive It Really Shouldn't Be This Easy

Remember just a few years ago, how it took a roomful of equipment just to work RTTY. And if you wanted more than one mode it took a dedicated computer system costing thousands of dollars. The new AEA Pakratts are proving it doesn't take lots of equipment or money to enjoy working all bands in five different modes.

## First, A Good Idea

The idea behind the Pakratt is very simple. One controller that does Morse, Baudot, ASCII, AMTOR, and Packet, and works both HF and VHF bands. Of course the decoding, protocol, and signal processing software must be included in the unit, and connection to the computer and transceiver have to be easy. The unit also has to be small and require only 12 volts, so it will work both in the shack and on the road.

## Second, Computer Compatible

It doesn't matter what kind of computer you have, we have a Pakratt for you. The PK-64 works with the popular Commodore 64 or 128, and the PK-232 works with any other computer or terminal that has an RS-232 serial port. The PK-64 doesn't require any additional programs. Simply connect to the computer and transceiver and you're on the air. The PK-232 needs a terminal or modem program for your computer. The one you're using with your telephone modem will work just fine.

## Fourth, AEA Quality and Price

Not many manufacturers like to discuss quality and price at the same time. AEA thinks you want high quality and low price in any product you buy, so that's what you get with the Pakratts. Ask any friend who owns AEA gear about our quality. The people who buy our products are our best salespeople. As for price, the PK-64 costs \$219.95, or \$319.95 with the HF option. The PK-64A, an enhanced software unit with a longer flexible computer cable, costs \$269.95 or \$369.95 with the HF option. The PK-232 costs \$319.95 with the HF modem included. All prices are Amateur Net and available from your favorite amateur radio dealer. For more information contact your local dealer or AEA.

Prices and specifications subject to change without notice or obligation.

## PAKRATT™ Model PK-64



## PAKRATT™ Model PK-232

## Third, Performance and Features

The real measure of any data controller is what kind of on-air performance it gives. While the PK-64 and PK-232 use different types of modems, both give excellent performance on VHF. The optional HF modem of the PK-64 uses independent four-pole Chebyshev filters for both Mark and Space tones, and A.M. detection. The HF option can be factory or field installed.

The PK-232 uses an eight-pole bandpass filter followed by a limiter discriminator with automatic threshold correction. The internal modem automatically selects the filter parameters, CW Fc = 800 Hz, BW = 200 Hz; HF Fc = 2210 Hz, BW = 450 Hz; VHF Fc = 1700 Hz, BW = 2600 Hz.

The PK-64 uses on screen indicators to show status, mode, and DCD (Data Carrier Detect) while the PK-232 uses front panel indicators. Both units use discriminator style tuning for HF operation. And that's just the tip of the iceberg. Features like multiple connects on packet, hardware HDLC, CW speed tracking, and other standard AEA software features are included in both the PK-64 and PK-232.

**AEA**

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Antennas that last "Decades"  
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20M326 3 elem. 20 Mtr.	\$385.00
20M536 5 elem. 20 Mtr.	\$635.00
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10M523 5 elem. 10 Mtr.	\$340.00
10M636 6 elem. 10 Mtr.	\$705.00
2MVS814, 2 Mtr. phased	\$269.00



For data on the complete line of Telrex antennas phone (anytime) and leave your call sign, or write.

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Write: **Telrex** P.O. Box 879  
Asbury Park, N.J. 07712

# Our Readers Say:

## And We Got Him Back

Editor, CQ:

I was a bit dismayed to see the letter entitled "We've Lost One" in the September issue of CQ. I am a member of the W5YI V.E. team here in Oklahoma City. Enclosed is my most recent submission to the "Collector and Emitter" (circulation 1086). The "C & E" is our local ham newsletter published by C.O.R.A. (Central Oklahoma Radio Amateurs). C.O.R.A. is a consortium of members from various radio clubs in the area, and our main function is to organize and plan our yearly ham convention, which we call Ham Holiday.

At the inception of volunteer testing, C.O.R.A. saw a need for a regular test session here in the greater Oklahoma City area and formed a core group of amateurs to administer tests. This February will mark our second year anniversary of regular monthly exams. As a matter of fact, two examination sessions were given in August; one in conjunction with our convention and the other at our regular testing site. There are other groups in the area also providing exams. Although I cannot state the frequency of these other groups' sessions, I do know that they intentionally schedule their sessions on the weekends to provide local hams, and aspiring hams, additional opportunities to test.

We advertise our test session both in the local ham publication and "talk it up" on the local 2 meter nets. Perhaps the word doesn't get around as well as it should. But as you can see in my "C & E" article, some people get the message; 37 candidates for the month of August.

My intent for this letter is to set the record straight. The hams in the Oklahoma City area ARE committed to the continuation of our hobby and we DO care. This letter will end on a happy note. The gentleman who sent in last month's letter upgraded from Novice to Technical four days prior to my receiving the September issue of CQ.

Ron St. Laurent, ND5S  
Yukon, OK

## Good Practice After All

Editor, CQ:

I believe Mr. Dan Robbins, KL7Y, has taken his views on the NZART paper to beyond sensible extremes (*Our Readers Say* column, August 1986 issue, "No QRM, Maybe No Hobby"). Maybe Mr. Roberts doesn't realize how much QRM some expeditions cause. This is much worse when a DX station listens on a number of frequencies on the one band. In England (I shall use a DXpedition in somewhere like FO8)

*\*CQ encourages its readers to send in for publication letters expressing your opinions, ideas, etc. We will print them as space permits, and we reserve the right to choose material as we see fit. Please address all correspondence to "Our Readers Say" care of CQ.*

all Europe is pointing their beams and 1 kw or more over us. Because there are a number of stations transmitting on different frequencies (calling this DX station) often with strong signals at the antenna, this is bound to cause distortion products in any receiver. This is without mentioning how wide some of these signals are. It is a fact that if someone puts a linear on the end of a transmitter, the output is wider than if there was no linear there. Though this can be kept minimal by good design, this is far from always true.

DXpeditions are far from the only cause of QRM. If only stations would switch off the linear after receiving a 5/9 plus 40 dB report and used 10 watts instead of 1 kw, their reports would still be 5/9 plus 20, and there would be a substantial reduction in QRM. It is good practice after all.

Michael Zatman, G0CNO  
Herts, England

## Supports Novice Enhancement

Editor, CQ:

The Zero Bias editorial in the September '86 issue relative to enhancement of the Novice class license is by far the most intelligent presentation of the subject I have read to date.

I can suggest two important, additional reasons why Novice class licensees should be granted additional privileges. One, strictly in the best interests of retaining our frequency allocations, is that if Novices gain the 220 MHz voice privileges proposed, we may be able to retain that band for amateur use, because on a national basis it will be used. The 220 MHz band is not now used sufficiently across the country to justify it remaining in the amateur radio service, and those other services which desire that band to alleviate their spectrum shortages know it! Unless we use it, we'll lose it—and "enhanced Novices" will use it.

More important from my perspective as a public safety administrator is the added resources police, fire, and emergency medical systems which rely on amateur radio for support communications will realize. Novices with at least 220 voice privileges can provide public safety communications. The Novice class as presently constructed is unusable to us in public safety. My Department's A.R.E.S. group presently has 40 members. We could use 60-70. With "enhanced Novices" we will realize that objective and thus be better prepared to respond to emergencies.

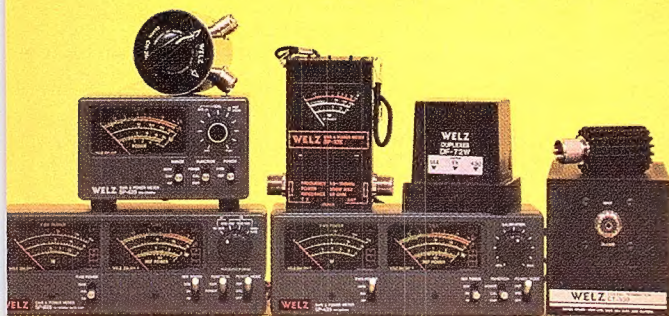
You might, on the one hand, consider me biased. My 27 years as an amateur, having come up "through the ranks" of the various license classes, my QCWA membership, and overall amateur radio interests notwithstanding, I firmly believe all of us in amateur radio should strongly support the Novice enhancement proposal. The future of the hobby may well depend on it.

Jerry Boyd, KG6LF  
Chief of Police  
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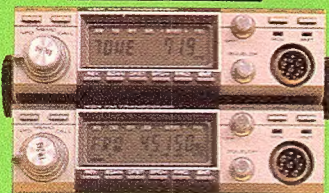
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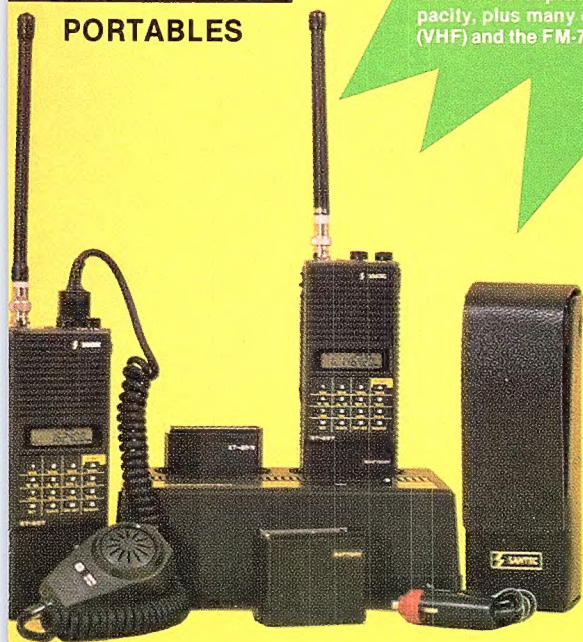
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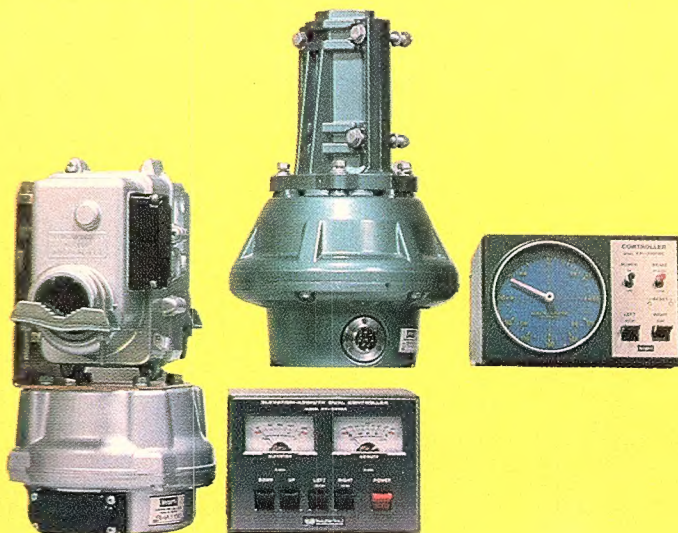


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# Announcing

• **New Morse Journal** - Since 1983 two Dutch radio amateurs, PA0BFN and PA3ALM, have published a quarterly journal, *Morsum Magnificat*, for Morse enthusiasts. Now British writer and radio amateur Tony Smith, G4FAI, has joined the editorial team as English language editor, and a new English version of *Morsum Magnificat* will be available shortly. *Morsum Magnificat* will publish material about Morse, ancient and modern, not normally found to any extent in popular magazines today, and will include history, illustrations, anecdotes, and adventures in both wire and wireless telegraphy. USA subscription for a year (4 issues) is \$10 postpaid from M. Hellemons, PA0BFN, Holleweg 187, 4623 XD Bergen op Zoom, Holland. Banknotes will be appreciated, owing to difficulties and high charges in clearing foreign checks. Further information is available from Tony Smith, G4FAI, 1 Tash Place, London N11 1PA, England, on receipt of IRC (2 for airmail).

• **WW II Merchant Marine Radio Ops Announce New Organization** - Reorganization of the Gallups Island Radio Assn. has been announced. The association is a non-political group of former WW II seagoing radio operators who attended or graduated from the U.S.M.S. radio schools. WW II merchant marine brasspounders are also welcomed by this organization. Over 5,000 men attended the various U.S.M.S. radio schools; these men are now scattered throughout the country. Many are ham radio operators, but all are extended a welcome. Ham radio nets meet daily on 3920 kHz (SSB) at 0700 EST, Saturdays on 7153 kHz (SSB) at 0900 EST, and Mondays on 3552 kHz (CW) at 2000 EST. In addition to on-the-air ham radio nets, and periodic reunions, a newsletter is distributed to all members. For more information send an SASE to Ralph Albers, W4ER, 5597 Seminary Road (Apt. 2013 South), Falls Church, VA 22041.

• **Motorola, Alaska Two-Way Radio Museum** - A Museum of Early Two-Way Radio Equipment has been established by Motorola Communications and Electronics, Inc. in Anchorage, Alaska. The Branch Manager for the state of Alaska, Don Parker, will serve as curator

of the collection. He has already acquired a few post-World War II tube-type items, but would greatly appreciate any donations of equipment or assistance from amateurs who may have interesting or unusual examples of two-way radio gear. Mr. Parker can be reached by writing Motorola, Inc., 5333 Fairbanks Street, Suite #1, Anchorage, AK 99502, or by calling (907) 562-2111.

• **WECA Equipment/"Elmer" Banks** - Newly-licensed hams who join the Westchester, New York Emergency Communications Assn. will be able to benefit from two new club programs, an equipment bank and an "Elmer" bank. Under WECA's program, hams with surplus equipment will list it with the bank coordinator, Bob Steinberg, WA2KHR. He will contact new hams who join the club to find out their needs, and will try to match up equipment with people who need it. Equipment will be loaned out for a 90-day period. More information about the equipment bank and Elmer bank programs is available from the club at P.O. Box 131, North Tarrytown, NY 10591.

• **Veteran's Day Special Event** - The Armed Forces Amateur Radio Net will operate a Special Events station to commemorate Veteran's Day from 1700 UTC Nov. 9 to 2400 UTC Nov. 11 on all bands 10, 15, 20, 40, 80 meters on 7.283 phone and 7060 CW, and 3920-3925 phone. Contact any AFAR member. Send SASE to WB1DWR, 16 Berkeley Circle, Newington, CT 06111.

• **Special Events Station at Hines V.A. Hospital** - In observance of Veteran's week, members of the Hamfestsers Radio Club, Inc., Chicago will operate from the Hines V.A. Hospital's Robert K. "Pappy" Wade K9CDH Memorial Ham Shack using the Hine's club call K9WFN from 1500Z to 0300Z Nov. 9. The club will operate on 40 meters, 20 meters, 2 meters F.M., and 2 meters USB. Frequencies are 14.260, 7.260, 146.43 simplex, 144.210 USB. Send QSL, QSO number, and 9 x 12 SASE with 39¢ postage to: Hamfestsers Radio Club, Inc., Chicago, c/o Robert K. "Pappy" Wade Memorial Ham Shack, Bld. 8, Hines Veterans Administration Hospital, Hines, IL 60141.

• **The following hamfests, etc., are slated for November:**

Nov. 1, **Hamfest Minnesota and Computer Expo**, Richfield, MN. Contact Hamfest Minnesota and Expo, Box 555, Minneapolis, MN 55440.

Nov. 1-2, **Ham Radio and Computer Expo '86**, Lawrenceville, GA. Contact Alford Memorial ARC, P.O. Box 1282, Stone Mountain, GA 30086, or call N8LM at 404-925-7615.

Nov. 1-2, **Odessa Hamfest**, Odessa, TX. Contact West Texas ARC, Box 7033, Odessa, TX 79760, or call KA5REM 915-366-0203.

Nov. 2, **Oak Park ARC Swap-N-Shop**, Southfield, MI. Contact Larry Macionski, WA2AJQ, 303 South Vermont Ave., Royal Oak, MI 48067 (313-399-3991).

Nov. 2, **RF Hill ARC Hamfest**, Sellersville, PA. Contact Hamfest Chairman, RF Hill ARC, 523 Vine St., Perkasie, PA 18944, or call W3BRU 215-257-2450.

Nov. 7-9, **AMSAT Fourth Annual Space Symposium and Annual Meeting**, Dallas/Forth Worth Airport Hilton Hotel, TX. Contact AMSAT HQ 301-589-6062.

Nov. 8, **The Newmarket Fleamarket**, Newmarket, Ontario, Canada. Contact Geoffrey Smith, VE3KCE, 7 Johnson Rd., Aurora, Ont., Canada L4G 2A3, or call 416-727-6672 after 1830.

Nov. 8, **New England DXCC Banquet**, Concord, MA. Contact Charles A. Lukas, Jr., W1DOH, RFD #1, 24 Durkee Rd., Acton, MA 01720 (617-263-3743).

Nov. 9, **Fort Wayne, IN Hamfest**, Fort Wayne, IN. Contact AC-ARTS Hamfest, P.O. Box 10342, Fort Wayne, IN 46851, or call K9JDF 219-485-0164 (6-10 p.m. EST).

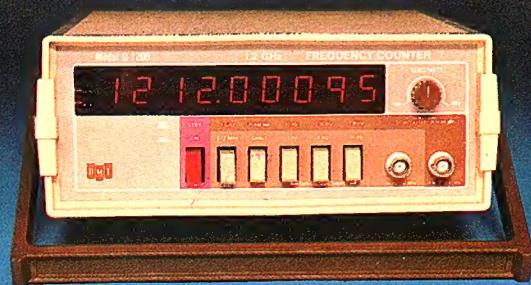
Nov. 15, **6.91 Friendly Fest**, Milwaukee, WI. Contact The Milwaukee Repeater Club, P.O. Box 2123, Milwaukee, WI 53201.

Nov. 16, **Massillon ARC Auctionfest 86**, Massillon, OH. Contact MARC, P.O. Box 73, Massillon, OH 44646.

Nov. 16, **West Orange Repeater Club Hamfest**, Orange, NJ. Contact Mike or Rob at 201-674-0507.

Nov. 22-23, **Greater Greensboro, NC Hamfest**, Greensboro, NC. Contact Fred Redmon, 3109 Goodall Dr., Greensboro, NC 27407 (919-852-9244 between 9-11 p.m.).

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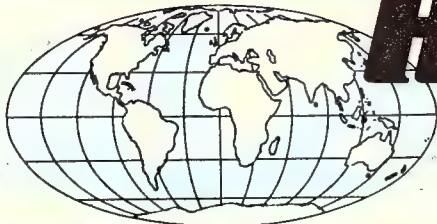
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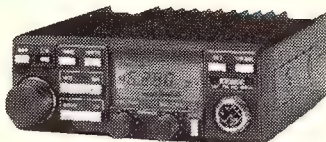
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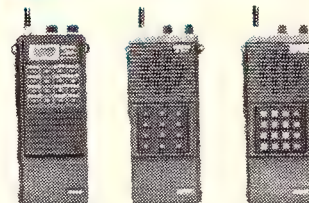
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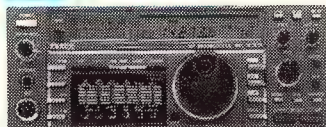
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***This month we begin a four-part series on packet radio by KR3T. Packet Radio isn't that mysterious or difficult to use. Follow the series and get in on some very exciting aspects of modern amateur radio.***

# **An Amateur Packet Radio Primer**

## **Part I—Introduction**

BY JONATHAN L. MAYO\*, KR3T

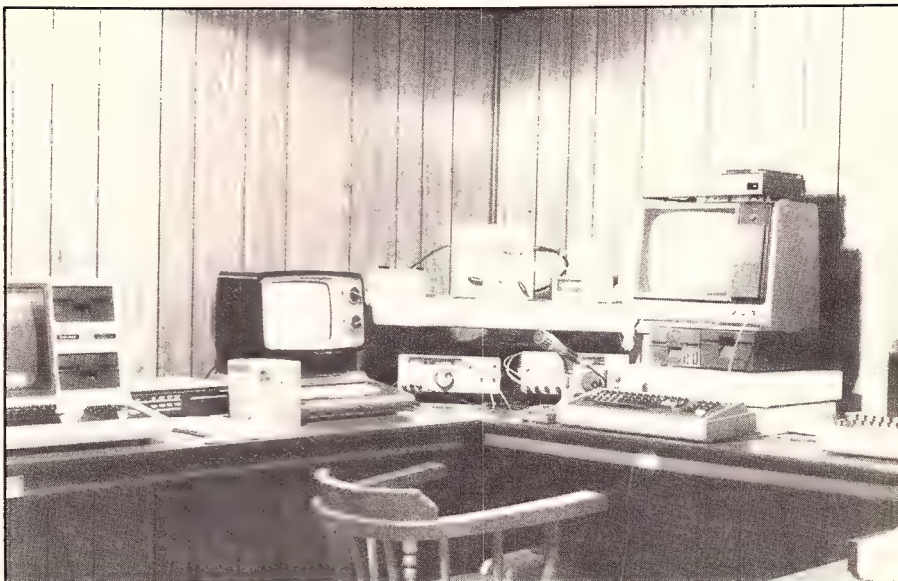
**A**mateur packet radio has been receiving a great deal of attention over the past few years, and justly so. Packet radio is the most capable mode of digital communications available to radio amateurs. Over the past two years the number of amateur packet radio stations in the United States has quadrupled. The number of packet stations has increased about 10,000 percent over the past 5 years inclusive. In 1982 there were approximately 200 amateur packet stations, and by mid-1986 there were estimated to be over 16,000 amateur packet radio stations; by the end of 1986 the number is predicted to exceed 20,000.

This is the first of a four-part article series designed to provide a complete introduction to amateur packet radio. Packet radio is often described as a form of "super" RTTY (Radio Teletype); however, as you will soon see, packet is a unique mode in and of itself. A wide variety of topics related to packet radio are covered in this article series. If you have not operated packet before, these articles will give you the necessary background to quickly catch up on what you've been missing.

Portions of the articles have been excerpted from my book, *The Packet Radio Handbook*, to be published by TAB Books, Inc. in January 1987. The book is featured in TAB's current trade catalog, and the cost is \$14.95. For more information, write to TAB at P.O. Box 40, Blue Ridge Summit, PA 17214.

Amateur packet radio is used with spectacular results everyday by ordinary amateur radio operators the world over. Individuals can transfer messages via packet almost anywhere in the United States through a network of "bulletin board stations" with an automatic forwarding system. Individuals can use their local bulletin board to send and receive mail, upload and download files (such as newsletters and computer programs), and as a "gateway" to retransmit their signal on another frequency. Imagine instructing the bulletin board to relay your transmissions to the 20 meter band; an amateur in Pennsylvania running only 5 watts on 2 meters could then communicate with another amateur on the west coast or even a foreign country (see fig. 1).

Many packet operators can share a single frequency and select with which stations they



*The amateur packet station at KR3T.*

wish to communicate. It is not uncommon to have an operator using a bulletin board station while two other operators are conducting a QSO and another two are transferring computer programs, all on the same frequency without interfering with each other.

Some amateur packet operators access amateur satellites directly to relay their transmissions with amazing accuracy to specified points around the globe. Amateur packet operators without satellite capability can access the satellites through an intermediary station known as a "teleport."

You will undoubtedly learn much more about packet radio's capabilities as you progress through these articles. Amateur packet radio is a new, growing, exciting, and largely yet unexploited mode.

### **Article Introduction**

At first glance packet radio can seem very complicated and confusing. A common assumption is that a packet operator must be an expert in digital electronics and computer programming. While that was probably true a few years ago, packet has advanced to the point where a complete packet station can be set up

and effectively operated by almost anyone. And for the microcomputer hobbyist, packet represents an ideal marriage between computers and amateur radio.

But we're getting ahead of ourselves. What exactly is packet radio and what does it have to offer? The purpose of this article is to provide an introduction to packet radio's capabilities. This article differentiates packet from the other modes of digital communications and provides a solid background so that readers with varying levels of experience will be able to understand the concepts presented in the rest of the series.

Amateur packet radio is a complex digital communications system that utilizes a high degree of computer technology to obtain a reliable, versatile means of communicating information. Despite the high degree of technology involved in packet radio, it is an easy mode to operate. Packet radio is being routinely used for error-free ragchewing, program and message transfers, satellite, and computer communications.

### **Digital Communication Basics**

In a digital communications system such as

\*1817 Saratoga Court, Allentown, PA 18104



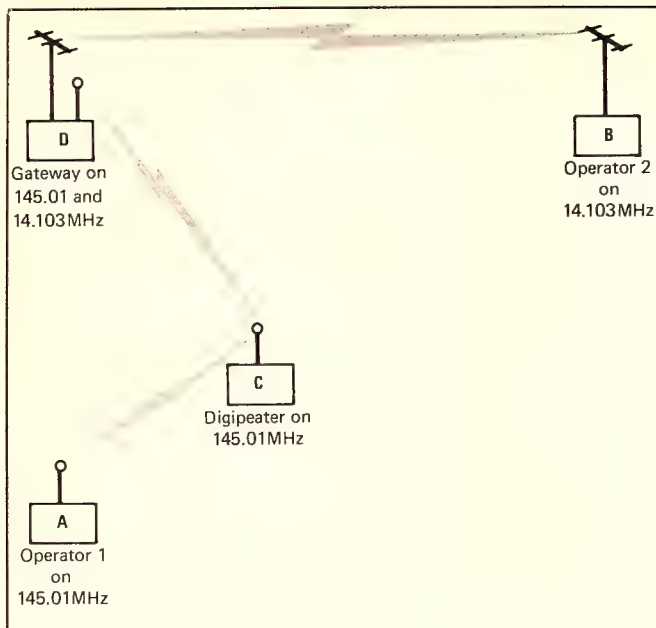


Fig. 1—A diagram of a packet radio network in which a digipeater (Station C) and HF gateway (Station D) are utilized to allow Station A on 2 meters to communicate with Station B on 20 meters.

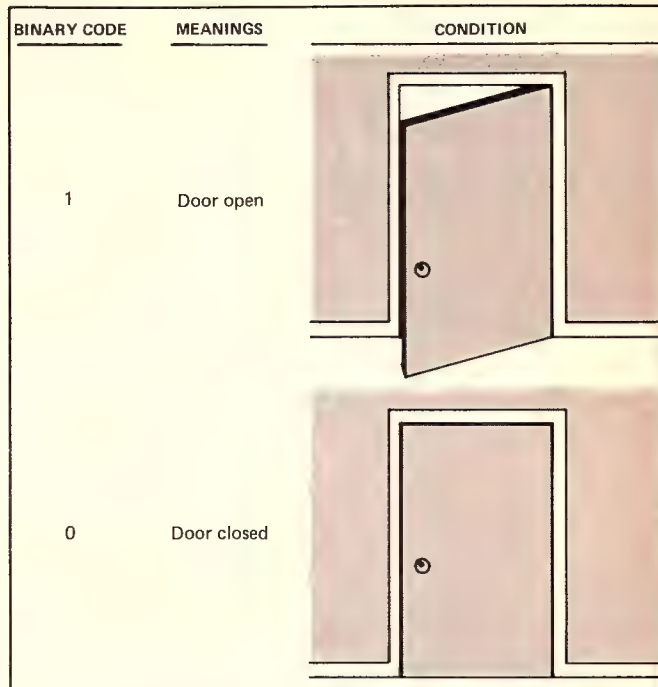


Fig. 2—One binary digit (bit) can be used to differentiate between two states such as an open and closed door.

packet or ordinary RTTY (RadioTeLeTYpe), information is transmitted and received in digital form; that is, each piece of information is represented by a digital code. The digital code is made up of one or more elements. These elements can have different states or levels. For example, our number system is a digital code in which each element is one of 10 possible levels (0 to 9). The number one hundred is represented by the code 100 in our decimal system of 10 levels.

In the Binary system there are only two states which are represented by a 1 or 0. Thus, there can only be two levels in each element. Each element in a binary number is called a **BIT** (BInary dIgIT). The number one hundred, 100 decimal, would be represented by the binary code 1100100.

The binary system (two states or levels) is used extensively in digital systems and communications. The two states can be represented in electronic equipment by two different voltages, two different currents, or two different frequencies. In most cases, a multiple (three or more levels) state system is not used due to the increased sensitivity and calibration of the electronics that would be required to differentiate between more than two levels. For example, it is much easier to construct equipment that can differentiate between two voltage levels, often one positive and one negative, than to build equipment that can differentiate between three, four, or more voltage levels.

In order to represent more than two different conditions using the binary system, the bits must be combined to increase the number of possible corresponding conditions. For example, one bit would be sufficient to indicate if a light were on or off, or if a door were open or closed (see fig. 2). However, to represent more complex concepts such as the number system or alphabet, several bits are combined. If two bits are used, four different conditions can be indicated. The total number of possible combi-

nations can be found by raising 2 to the power of bits that have been combined (i.e.,  $2^2 = 4$ ,  $2^3 = 8$ ). Since the alphabet has 26 different characters, 5 bits must be combined for a total of 32 different possible characters. To include the numerals 0–9, upper- and lower-case characters, and some punctuation, a minimum of 7 bits is needed for a total of 128 possible combinations.

Getting back to the number one hundred (100 decimal and 1100100 binary), 7 bits must be combined to represent the number 100 in binary. Six bits are too few (only 64 possible combinations), and 7 bits are too many (128 possible combinations), so we must choose the larger. While it is relatively easy to convert between binary and decimal, it is not covered in this series. Most computer books contain a conversion table in their appendices should you ever have need of switching between binary and decimal.

This is how information is transferred using digital communications. Each piece of information is assigned a binary combination which is transmitted to the receiving station(s) where it is reassigned the same information, provided the sending and receiving stations are following the same binary combination assignment (code). This information is usually characters in text; however, it could also be digitized pictures or voice or anything else that could be broken down into discrete pieces of data (see fig. 3).

There are several standardized codes in use today for the transfer of text data. Some of the following may be familiar to you: ASCII (American Standard Code for Information Interchange), EBCDIC (Expanded Binary Coded Decimal Interchange Code), Baudot, and Murray. There are others, but these are the most common.

Once these binary combinations are generated (whether by a mechanical teleprinter, a microcomputer, or some other device for communications purposes), they are often sent to a

modem (MOdulator DEModulator). This device generates (modulates) tones (frequencies) which correspond to the state of each bit for transmission over an analog medium (such as a radio link or telephone line). The two tones are given special names. The tone corresponding to the binary 1 is called the **Mark** and the tone corresponding to the binary 0 is called the **space**. (This terminology dates back to the early days of telegraphy when an automatic receiving device would lower a pen on a strip chart when a signal was present, making a mark. Of course, when there was no signal, the pen would not touch the strip of paper and a space would result.) These tones are then transmitted by a radio transmitter, or carried via cable, to the receiver(s), where the tones are converted back into bits (demodulated) by another modem. This is how the binary information gets transferred from sender to receiver.

A transmission medium in which two separate signals may be transmitted in opposite directions at the same time is known as a **full duplex** channel (i.e., two stations may transmit to each other at the same time). A transmission medium in which two separate signals may be transmitted in opposite directions but only one signal may be transmitted at a time in either direction is known as a **half duplex** channel (i.e., two stations may transmit to each other but not at the same time). A transmission medium in which only one signal may be transmitted at a time in only one direction is known as a **simplex** channel (i.e., one of two stations transmits and the other receives). A half duplex channel may be considered a simplex channel that reverses direction between stations.

## Packet vs Other Digital Modes

One of the questions about packet radio that I am most frequently asked is how it differs from the other modes of digital communications available to amateur radio operators.



[illegible]

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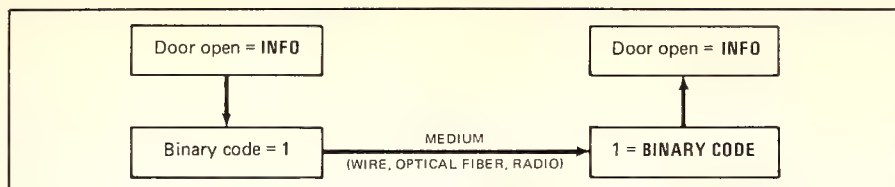


Fig. 3—To transfer the condition of the door to another station, the state of the door is noted as information and the binary representation is sent to the other station. At the receiving end the binary representation is reassigned the same information.

CW, Baudot RTTY (RadioTeletype), ASCII RTTY, and AMTOR (AMateur Teletype Over Radio) are the major digital communication systems in use today in amateur radio besides packet. This section discusses the capabilities of each of these digital communication systems and then details the capabilities of packet radio. After the discussion, you should have a good understanding of what packet radio has to offer above and beyond the other modes.

CW is the oldest form of digital communications. It uses an uneven form of coding—usually the Morse code. In an uneven code, the number of elements that make up each character are not equal; thus some characters have more elements than others. The Morse code contains most characters needed for communications and requires very simple equipment for transmission and reception. With the advent of computerized keyboards and decoders, CW can be sent very quickly. However, the slightest bit of interference or imperfect sending can reduce the decoder's ability to accurately copy the code. Compared to other forms of digital communications, CW

leaves a lot to be desired. On the plus side, CW is the only form of digital coding which can be copied easily without the aid of decoding equipment.

Baudot RTTY uses an even form of coding known as the Baudot (or Murray) code. In the Baudot code each character is made up of five mark and space elements (or bits). However, there are only 32 possible combinations using a 5-level code. Therefore, the Baudot code includes two different character sets, figures and letters; the character sets are alternated as needed.

Baudot RTTY operation usually takes place at speeds of 45, 50, or 75 baud using either solid state equipment or mechanical teleprinters. In most cases, the baud rate is roughly equal to the number of elements (or bits) sent per second.

ASCII RTTY was first legalized in 1980 by the FCC for amateur use in the United States in response to the wide proliferation of computer equipment which uses the seven element ASCII code. Its primary advantages over Baudot RTTY are its speed (usually 110 or 300 baud) and its 128 possible characters. Solid state equipment is usually used for ASCII operation, but mechanical teleprinters can also be used. In operation, ASCII RTTY is very similar to Baudot RTTY except for the coding used.

AMTOR was first legalized for amateur use in 1983. AMTOR uses a special even coding in which there is a constant ratio of mark and space elements. If the received characters do not have the proper ratio, they are presumed erroneous. AMTOR operates at 100 baud and because of error checking is much more reliable than standard Baudot or ASCII RTTY.

## Packet

Finally, we get to packet. Packet is the most advanced form of digital communications available to radio amateurs. The primary advantages of packet radio are speed, networking, error checking, and efficient use of frequency space.

Packet radio operates using a standard digital communications networking technique known as **Carrier-Sense Multiple Access with Collision Detection (CSMA/CD)**. Put simply, this means that a packet station will not transmit when the frequency is busy. It will wait until the frequency is clear and then transmit a short burst (frame) of information. Because packet transmissions are very short, many packet stations can be on the same frequency without interfering with each other. A line of text that takes 30 seconds to type can be transmitted in a fraction of a second.

Should two or more packet stations transmit on the same frequency at the same time, their transmissions (packets) may interfere with each other (collide). If a collision occurs, each station will wait a random length of time and try again. Most likely, one station will wait a short-

er length of time and thus transmit before the other station(s). Its carrier will prevent the other station(s) from transmitting until it is finished.

Most packet activity today is at 1200 baud on the VHF bands and at 300 baud on HF. Soon packet will be operating at 9600 baud and up on VHF as modem technology advances.

Packet's error checking follows the **HDL**C (High-level Data Link Control) format. The data input by the user is grouped together in "bundles" of usually 128 characters. The binary digits (bits) which compose the data and any other information to be transmitted (such as the sending and receiving station's call signs) are put through an extensive polynomial expression and a number unique to the specific data being transmitted is generated. This number is known as the **FCS (Frame Check Sequence)**. The FCS is sent along with the data. When the receiving station gets the data and the FCS, it recomputes the FCS using the same expression and compares it with the one received with the data.

If the two FCSs match, the data is assumed error free and an **acknowledgement (ACK)** is sent to the transmitting station. If they do not match, the data was not received exactly as the transmitting station sent it, so the receiving station ignores the transmission. The transmitting station will retransmit the data after a period of time.

For all this to work, the two stations must be using compatible equipment and the same **protocols**. The equipment in packet radio consists of three main components in addition to a transceiver: a digital communications terminal, a **TNC (Terminal Node Controller)**, and a modem (**MOD**ulator **DEM**odulator). The two modems must observe the same standard—usually Bell 202 on VHF and Bell 103 on HF. The two TNCs may be of different manufacture, but they must use the same protocol. Do not confuse amateur packet radio TNCs with RTTY Terminal Units and modems.

Protocols **define** the format of the information sent on packet. The protocol organizes the information to be transmitted into "frames." A protocol also defines what steps are to be taken by the TNC under different circumstances. Networking procedures are another area which the protocol defines.

There are two main amateur packet radio protocols in use today: **AX.25** and **VADCG (or V-1)**. **AX.25** was developed by AMRAD (Amateur Radio Research and Development Corp.) and RATS (Radio Amateur Telecommunications Society) and is a modified version of the X.25 commercial protocol. The **VADCG** (Vancouver Amateur Digital Communications Group) protocol was written by Doug Lockhart, VE7APU. He wrote it in the late 1970s as an experimental protocol for use with TNC testing. The VADCG protocol achieved widespread use in the early days of packet radio.

The AX.25 protocol was developed in 1982 to provide some additional needed capabilities not present in the VADCG protocol. Packet had grown enormously since Doug wrote his protocol, and since the VADCG protocol was not designed to support a large number of users and had limited networking capabilities, an extended protocol was needed. AX.25 offers the advanced capabilities needed for an extended packet network. Today, AX.25 is the most widely used protocol.

Since the sending and receiving stations' IDs (usually their call signs) are included in the frame, the frame can be routed through differ-

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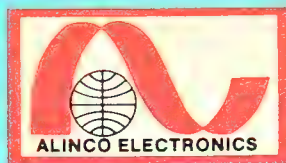
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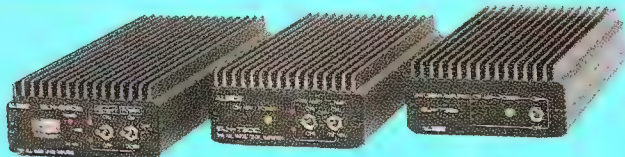
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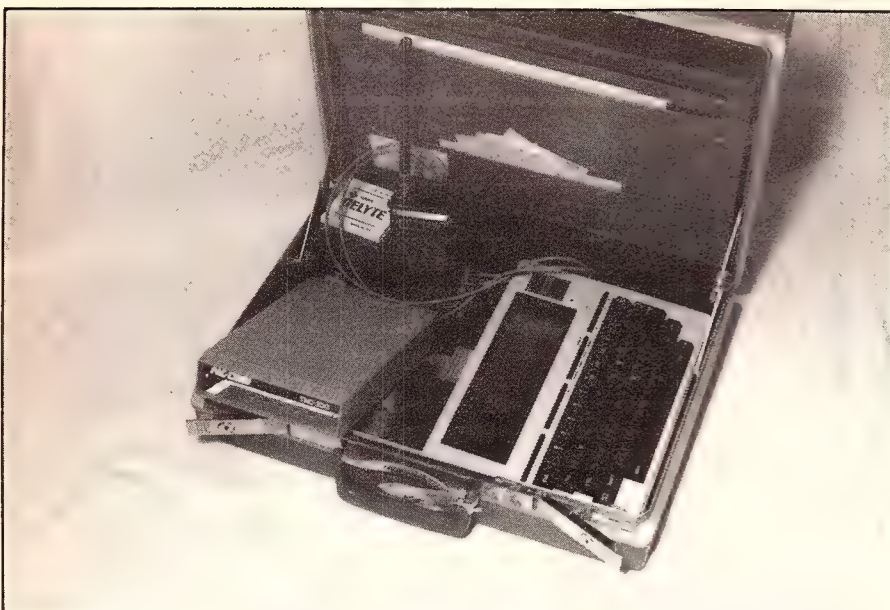
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*A complete portable packet station in a briefcase consisting of a TRS-80 Model 100 portable computer, a Pac-Comm TNC-200, and IC-02AT, and a gel cell battery.*

ent intermediary stations to reach its destination. These intermediary stations can include **digipeaters** (simplex packet repeaters), satellites, and HF Gateways. There is great potential in using packet's networking capabilities to link large areas of the world together.

It is easy to see how much more versatile packet radio is than the other forms of digital communications. While ordinary RTTY can only be relayed through duplex repeaters, packet allows for multiple controlled relays through simplex repeaters. Packet's controlled transmissions assure error-free reception, and packet's high speed reduces the time a packet station must transmit. Packet radio can be used for simple ragchewing, both local and DX, as with the other digital modes; however, packet offers so much more. Today packet radio is as simple to operate as ordinary RTTY.

No special programming or computer knowledge is necessary. In fact, a microcomputer is not required to operate packet; almost any communications terminal will work.

### Packet Station

The basic packet radio station is composed of four main components: the terminal/computer, a TNC (Terminal Node Controller), a modem, and a transceiver. Originally, the name "Terminal Node Controller" was derived from its use in packet communications networks. Although TNCs can be found at intermediate nodes in a packet network, the name refers to controllers of end (terminal) nodes in the network.

The TNC is the "heart" of a packet radio station. The TNC organizes and controls the transmission/reception of the data. The TNC

comes in three different flavors: a software package running on a computer with an external modem, a separate hardware circuit board with external modem, and a separate hardware circuit board with a built-in modem. By far, the hardware board with built-in modem is the most popular. It may be used with a dumb data terminal or a microcomputer running terminal emulation software.

The software-based TNC uses the processor in the computer to handle the TNC's various functions. An external modem is then added to the computer, and the computer serves as both a TNC and a terminal. However, because the software approach consumes a lot of memory and processor time, and because of the complexities involved in writing the software along with the inability to easily produce it for a wide range of computers, the software approach has not become very popular. The microcomputer-based software approach has many advantages, but at the present time they do not outweigh its disadvantages compared to the hardware based TNCs.

The other components of a packet station are the terminal and the radio. The transceiver is usually a common 2 meter FM rig; however, packet operation occurs on other frequencies as well. Do not be concerned with the transceiver. Most any 2 meter transceiver or Handie Talkie will do in the beginning.

Setting up a packet radio station, like most other modes, varies greatly in cost depending on what equipment is needed and what kind is acquired. A complete system starting from scratch could cost as little as \$300 and up to over \$2,000. If you already have a computer or terminal and a transceiver, the cost varies from \$50 for a software package and modem up to \$500 for an expensive TNC with a built-in modem. Most hardware TNCs with built-in modems sell for around \$200, although many can be found for less.

### Conclusion

This article has covered mostly background material necessary for an understanding of amateur packet radio. Starting with several operating examples, the article progresses to digital communications, binary coding, and packet radio. Do not worry if some of the more technical material left you a little confused. Casual packet operation does not require in-depth knowledge anymore than using the telephone requires a knowledge of DTMF tones, exchanges, and trunks.

If you have any questions, comments, or suggestions regarding the article series, my packet book, or packet radio in general, please contact me. You can write to me at the address listed in the beginning of this article. However, if you would like a quicker response, leave me a message on CompuServe. My ID is 72276, 2276. Also, while you're on CompuServe, visit the HamNet forum. HamNet is dedicated to most all aspects of amateur radio, including packet. To get to HamNet, use the "GO HAMNET" command. I have an online column dedicated to packet radio in the HamNet Online section (GO HAM-1) which I invite you to access. The column is called Packet Radio Online.

Next month, just in time for Christmas, I'll discuss Terminal Node Controllers (TNCs) in more detail along with the specifics involved in setting up an amateur packet radio station.

*(To Be Continued)*



*The radio equipment at KR3T. A Kenwood TS-430S is used on HF, an ICOM 271-A is used for 2 meter base operation, and an IC-02AT HT is used for portable operation.*



# CQ REVIEWS:

## Advanced Computer Controls ShackMaster 100

BY LEW McCOY\*, W1ICP

**T**his is a product review of a rather unusual device of a truly wonderful nature, the ShackMaster 100, manufactured by Advanced Computer Controls (ACC). This device is used to control your own station from a remote location. However, before going into the review itself, I feel some background about remotely controlled radio operation is in order. To many readers here in the west this will be old stuff, but it will be new to most, so please bear with me.

Many years ago, an amateur in California who was an ardent DXer found he was faced with a serious problem. He was surrounded by high hills, living in a deep valley, which, of course, hindered his signal path. Rather than running extremely long feed lines to antennas mounted on one of the hills, he got the rather brilliant idea of building a station on a mountaintop complete with antennas, and then operating the mountaintop station from his location in the valley. He remotely controlled the station by radio links on VHF and UHF.

Other amateurs soon copied his idea, using their stations to improve poor locations. As an aside, this idea was also the basis for repeater operation. An amateur put a VHF station on a high location in order to extend the range of his low-power mobile signals. He invited other amateurs to use his remote station, and the idea of repeaters was born. (It is true that commercial stations used remotes and repeaters, but never to the extent of amateur radio.)

Just for a historical note, I went out to a large convention in Los Angeles to give a lecture on TVI (back in 1952). A couple of young (very) amateurs showed me a rack and panel setup of equipment and asked to demonstrate it to me. They gave me a mike, and I immediately contacted an amateur in San Francisco. After the contact I asked if the equipment was on 80 or 40 and did a complete double-take when they said, "No—it is on 2 meters!" They



*Here is the front view of the ShackMaster 100—slim and trim!*

explained how they had linked a couple of remotely controlled stations to reach between the two cities. Naturally, I was excited. However, even though I tried very hard with the powers that be (were) back east, I couldn't evoke much interest in the mode. What is the cliché about hindsight?

I might add that as repeaters became popular the FCC found they had to write separate rules for their operation and also for remotely controlled stations. In fact, here in the west, amateurs refer to remotely controlled stations as "remote bases," and there is a sharp difference in their use and use of repeaters. (The FCC insists on calling remote bases "remotely controlled stations," and I make this point so you'll know in this review what I am referring to when I discuss FCC rules.)

One further item for background before I go into the actual review. Many readers, particularly those in the east, have no concept of modern remote base operation, so let me give you a brief run-down. I belong to a small group of amateurs who operate four to five remote bases that are all linked together. We have these bases installed on high mountains (9000 feet plus). From these remote bases we can operate several bands and access at least 40 or more 2 meter and 450 MHz repeaters! In 95 percent of the cases we do all this with a 1 watt handheld from anywhere in an area that covers many thousands of square miles. As if this was not enough, our remote-base group has joined other groups around the

west linking with theirs. If desired, our range can be extended almost anywhere in New Mexico, Arizona, and California—plus more. Of course, all this represents a very large investment for installation and upkeep. The important point is that remote base operation has been around a long time and will be in the future.

### The ShackMaster 100

First and foremost, the ShackMaster is a device that is installed in your home station and will work in conjunction with your transceivers. In essence, the unit will convert your home station (or, for that matter, any station) to a remotely controlled station, control being by either radio or telephone lines. There is so much to say about the ShackMaster that it is difficult to know where to begin.

Let's assume you have the unit installed in your station and you are out operating mobile. You can now access your home station from your mobile and do many things. For example, you can listen on your mobile to your home station on any amateur band and actually tune the home receiver up and down the band. You can rotate your home beam from the mobile. How about actually transmitting from your mobile on VHF or UHF to a 20 meter DX station! Or keeping a sked on 80? Or, access the telephone just as you would through a regular repeater. You can turn on your microwave or oven and start dinner. How about checking your

\*Technical Editor, CQ, 200 Idaho St., Silver City, NM 88061



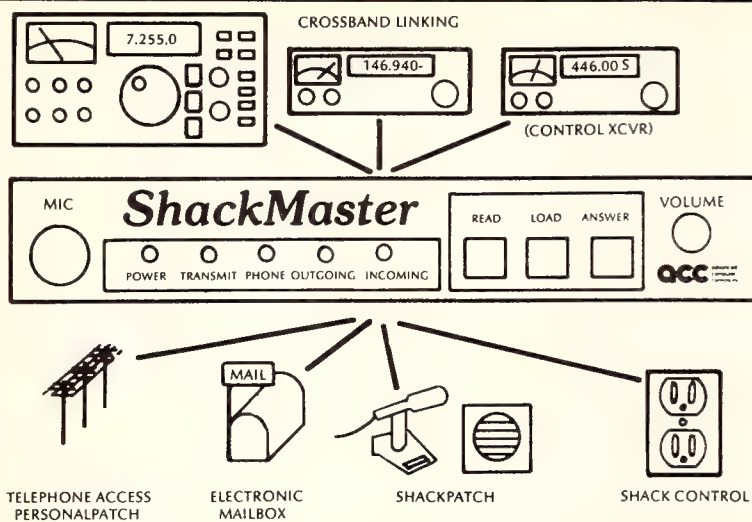


Fig. 1—This is a page from the manual showing the various units that can be connected to the ShackMaster.

home telephone answering service? (**Remember—no business calls over the air!**) Fig. 1 is a drawing from the very excellent instruction manual that comes with the ShackMaster. These are only a few of the things you can do. Actually, there is much more. For example, all of the above could be done by a telephone call to your station! Suppose a rare DX station or expedition is on and you are not home? All you need is a telephone to call home and turn on the rig and go at it! More about these different functions in a moment.

Physically, the ShackMaster 100 measures 7 inches deep, 11 inches wide, and 2 inches high. It is powered by a separate supply, one of the small 12 volt plug-in types. As you can see from the inside view photo, it looks like (and is) a computer-type device. Referring back to fig. 1, one can see that the ShackMaster 100 can be connected to three transceivers. Under present FCC rules for radio control, control must be done above 220.5 MHz. In the example shown, one of the transceivers is in the 450 MHz band. As an example, if you had a 450 MHz mobile, you could access the 450 MHz radio attached to the ShackMaster. This radio in turn could be used to transmit and receive on 450, or crossband to the 2 meter transceiver, or to the low-band transceiver, 160 through 10 meters.

All controlling is accomplished by using Touch-Tones®. And, all frequency controlling on VHF and UHF (changing frequencies at the ShackMaster) requires transceivers using thumbwheel-type frequency switching, BCD (Binary-coded-decimal). This type of switching is used in a wide variety of amateur VHF

and UHF rigs. The HF transceiver must have provisions for external control via either a series or parallel port.

At present, the ICOM 751, the Kenwood models TS-440S and TS-940S, and the Yaesu FT-757GX are the only 160 through 10 meter rig that have the necessary internal microprocessors that will interface. All of my testing was accomplished using an ICOM 751, which proved to be an outstanding transceiver for this purpose.

In addition to the types of control already mentioned, there are certain activities that can be controlled from the front panel of the ShackMaster. One important

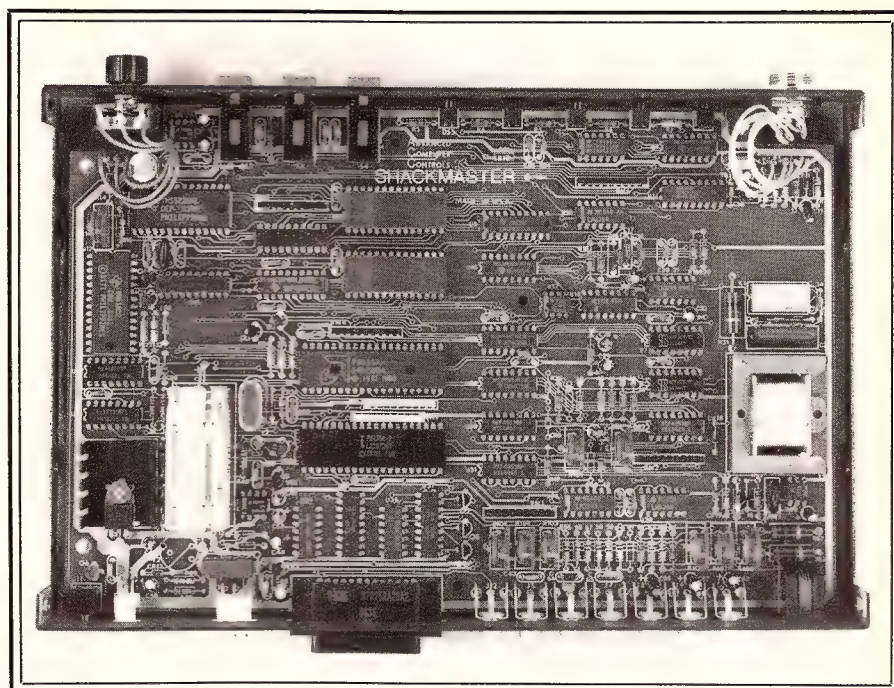
point that I haven't mentioned is that the '100 responds to your commands in its own synthesized voice. The quality of the voice itself is very good and quite clear.

## Crossband Linking

The unit can control up to three transceivers for crossband linking. Its control capabilities include detecting a signal (present from a squelch open, or carrier-operated-switch logic signal), controlling transmitter on/off (push-to-talk), and switching and mixing receive and transmit audio sources. It is also capable of controlling the frequency and mode of many externally controllable rigs. All controls are in response to your Touch-Tone® commands. Keep in mind that when you send the tones, the ShackMaster always responds with its voice confirming what you sent.

One of the first questions a reader would ask is if it is possible to control your home station (via ShackMaster) from your mobile or handheld, going through a repeater to do so. The answer is of course you can. (Your local repeater may not have autopatch, but you would with the ShackMaster unit!) This poses another question. If you use the '100 for autopatch going through a repeater, what's to keep other amateurs from using your phone? Good question! The ShackMaster will only acknowledge valid system command codes which you can change any time you wish.

All commands are preceded by your personal command prefix via your Touch-Tone® pad. For example, ShackMaster has a talking S-meter, so let's assume



Inside the ShackMaster 100. The controls along the left rear are for setting the various audio levels.

\*Touch-Tone is a registered trademark of the American Telephone and Telegraph Company.



your command prefix is 456. You are listening to another station via ShackMaster and you want to know his signal strength. You send 456 then the numeral 8. The '100 responds, in voice, with an S-meter reading! Likewise with your beam rotator. You send your prefix (456) then the numeral 4, then the degree heading desired. ShackMaster rotates the beam and responds accordingly.

### The Electronic Mailbox

Another feature is that mailbox messages can be loaded and read from over the air, from the phone, or from the shack. Outgoing messages are directed

from the phone or shack to the mobile/portable. Incoming messages originate from the mobile or portable.

ShackMaster contains ten predefined mailbox messages:

1. Will you be home late?
2. Please call home.
3. Are you going home?
4. I will be home late.
5. I will be home on time.
6. All is OK.
7. Please cancel our meeting.
8. Message green.
9. Message yellow.
10. Message red.

Messages 8, 9, and 10 are general pur-

pose and can mean anything you want.

Any of these messages can be loaded via buttons on the front panel of the '100. By the same token, any message that has come in is stored in the memory and recalled and read via the READ button.

### BSR X10 Shack Control

There is a device called the BSR control system which consists of a number of appliance, lamp, and wall switch modules which connect to the power line. These systems are available from a number of sources, including Sears, Radio Shack, and Heathkit.

ShackMaster has provisions for remote control of the BSR system, either by remote radio or by telephone. Touch Tone® commands can be sent to turn the appropriate appliance, lights, etc., on or off.

### ShackPatch

ShackMaster allows you, through either VHF/UHF transceiver, to remotely perform the control operator function for your home station. In a manner similar to an autopatch, the '100 lets you communicate with third parties. It just doesn't use the phone, it has its own mike. As mentioned earlier, the '100 is an alternative to repeater and simplex autopatches for communicating with your family.

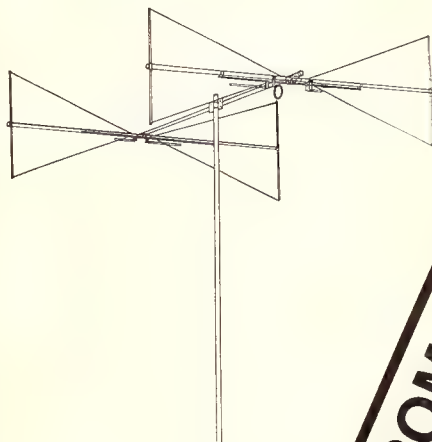
When you activate ShackPatch with your tone commands from your mobile/portable, on a simplex frequency or through a repeater, the '100 rings in the local speaker in your shack. It is answered by pressing the ANSWER button on the front panel. The conversation back and forth is synchronized to Push-To-Talk for easy back and forth exchanges. A periodic control "window" keeps you in control at all times. (The duration and intervals of the window can be changed.)

Of course, ShackMaster will ID for you. You program your call into the '100 and from then on, whenever you are operating the unit, it will automatically ID (in voice).

When remotely listening through ShackMaster to your transceiver, there are several modes of tuning. You can scan up or down slow, medium, or fast. You can "bump" up or down in increments of 20 Hz, 100 Hz, or 500 Hz. Or, you can listen on any desired frequency with an accuracy to 20 Hz. As you can see, it would be easy to keep skeds exactly on frequency. As mentioned earlier, I used an ICOM 751 transceiver which was superb for the purpose. In one of my tests I operated about 30 miles away from the home QTH. I got on 20, control was on 450, and although I had tested the setup directly in view of ShackMaster and the ICOM 751, it made my hair stand up from the remote location. I first programmed 14100.0 into the unit via my Touch Tones®, and of course I was pleased to hear ShackMaster come back

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*This shows the back of the unit with the various connections.*

in its voice and say "fourteen point one zero zero"! I then checked my beam heading, and again the '100 came back and told me where the beam was pointing. I changed the heading to Europe and told ShackMaster to scan up slowly. I heard a German station and worked him. Before I finished I had worked about 30 DX contacts. Then for kicks I turned on the 2 meter rig (at the home QTH) and worked one of our wide-area repeaters and let the boys hear 20 meter DX, etc. There was lots more I tried (and accomplished). Frankly, that was a pretty wild day. One cannot help but realize that amateur radio has come one heckuva long way from the early days.

It is really too bad that some of the powers that be try to keep us in the horse and carriage days. You see, one problem with this type of operation is that **all control must be above 220 MHz** (and it certainly would be nice if we could control from some of the other bands). This is not a serious handicap, although some of us petitioned the FCC to relax the auxiliary operating requirements to give us more flexibility. Many readers may not know it, but in most cases in order to operate a repeater you actually need two repeaters—one to control the other one (auxiliary operation). This was fine a few years ago in the dark ages of repeaters, but it is no longer true. The FCC went along and proposed some rule changes to fit the operation. However, those powers that be fought the change, so the FCC dropped the proposal.

## Hardware

Meanwhile, back at the ranch as we like to say out here in New Mexico (!), let's talk about the connections to the ShackMaster. As you can see from the back-view photo, the connections are fairly simple. Phono-plug terminated cables are used. There are connections for three transceivers. HFTX and HFRX are your low-band transmit and receive inputs. These are both audio signals and come from the transceiver audio line and go to the mike. The two VHF and UHF rigs

have the same type input and outputs, transmit audio from the rigs to the '100. The telephone jack is a standard phone-line receptacle. Just plug in a line from there to your phone line. The logic lines from the ICOM 751 or Kenwood transceivers are via DB-25 connector.

The front view shows controls for READ (messages), LOAD (messages), and the ANSWER button (to reply). There are activity LEDs telling the viewer what is taking place.

## Impressions

All amateurs are gadgeteers by their

very nature, and the ShackMaster 100 is almost the ultimate gadget, or maybe I should say the "ultimate" tool for our hobby—at least I think so. Over my many years in the hobby I met countless amateurs who had to live in apartment buildings, had lousy locations, and so on. Certainly the ShackMaster is a way for an enterprising amateur to wind up with a good location operated from a poor one.

I should point out that this is absolutely not a device you can take out of its carton and just plug in and expect everything to work. The manual is excellent and easy to read, but it takes considerable study. Hooking everything together is simple. Once done, you are ready to try controlling. To me, it is really an outstanding piece of equipment. I might add that the product is American made by Advanced Computer Controls, Inc., 10816 Northridge Square, Cupertino, CA 95014 (408-727-3330). The fellows there are all amateurs (very, very smart ones!), and they are always willing to help with advice and guidance.

The ShackMaster 100 has an amateur net of \$695.00. Two desired options are mentioned in this review. One is the frequency control of a thumbwheel-synthesized transceiver via the FC-1 frequency control board. The FC-1 sells for \$49.00. The second option is the rotor control interface via the RCB-1 rotor control board. The RCB-1 sells for \$76.00.

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# How to Successfully Fail At Being a Novice

BY PETER R. O'DELL\*, KB1N

**Y**ears and years ago I failed miserably at being a Novice. The experience was devastating. I questioned my own self-worth. I felt that, obviously, I did not have what it takes to be an amateur. I envied my buddies who had not failed, and at the same time I resented their success. From 1964 to 1971 I pushed the thought of ever making it on the air to the back of my mind.

Somewhere around the eighth or ninth grade I picked up a copy of *Popular Electronics* at the local newsstand. From there it was on to the big time with CQ and 73. The fad was to stand around in the hallways at school and dream out loud about owning a Drake 2-B or Knight T-160. Now you probably couldn't give away one of these boat anchors at a hamfest.

Then one day when I was a junior, Dad came home from work and told me that he had seen a notice on the bulletin board. The factory's amateur radio club was starting a Novice class. He offered to drive me if I wanted to take the course. My prayers had been answered. Surely everything would now fall into place. Little did I know what I was in for.

The club's shack was just that—a storage shed that the plant's recreation committee had turned over to the amateur radio club. However, I approached it with the same awe *normal* people usually reserve for the Taj Mahal. Inside we found several middle-aged men gathered around a Heath Sixer (an inexpensive 6 meter AM rig from antiquity).

Others showed up, and soon the class was going. Code was pounded out with a straight key and a tube-type code practice oscillator (CPO). Theory came from practical experience and the ARRL *License Manual*. Compared to today's preparation materials, things were a bit on the primitive side.

Weeks went by, and the theory was coming easy. The code, on the other hand, was not something that I picked up quickly. (For one thing, I had learned it as dots and dashes drawn across the printed page before the class started. That required a bit of unlearning.) After a few weeks, however, I was making some progress.

Then came the test. Somehow I made it through the exam in spite of the sweaty

palms, elevated blood pressure, and jitters. Although he couldn't grade my test or even legally look it over in those days, the fellow giving me my exam felt sure that I had passed. In four weeks or so I had my "ticket."

In the meantime, I had scraped together enough money for a used receiver, coax, and enough wire for an 80 meter dipole. My first transmitter was one that I built, but after looking it over, the guys at the club suggested that I not put it on the air. Although I had exactly followed the schematic in *Understanding Amateur Radio*, I had spread out the components over a huge chassis (no one ever mentioned that this wouldn't be such a good idea). The result was a signal that surely would have netted me a QSL from the FCC. Failure as an equipment builder! My confidence level was dropping, but it would go lower—much lower.

Someone in the club noticed my reluctance to rebuild the transmitter and took pity on me. With the statement "We've got to get you on the air," or something to that effect, I was given a "loaner." It was a transmitter capable of about 75 watts input power, and it weighed about 150 pounds. (The official measurement unit for the efficacy of boat anchors is the "pound-per-watt.") There was no VFO, just a socket for the crystal.

Home it went and I hooked it up. I had four switches to throw each time I went from transmit to receive. Once I had it hooked up, panic set in. I no longer had an excuse for not being on the air. Cumber-some as it was, I had a workable station.

I thought maybe I should just listen for a little while until I got the hang of it. I did a lot of listening, but nothing really seemed to sink in. Every so often I'd think about transmitting, and then I would "remember" about 200 other things to be done.

Finally, one Saturday night (about 9 PM local time) I got up my nerve and called CQ in the middle of the 80 meter Novice band. As I threw the last switch, I heard my callsign coming back to me in the millions of other stations trying to use that frequency. Oh, no! What do I do now? I got the callsign of the other station, barely.

After telling him my name and location, I turned it back to him. Once he was past the callsigns, he might as well have been firing a machine gun. I got nothing. Back I went and asked him to slow down. He repeated at about the same speed, and again I got nothing.

Once again I asked him to slow down, and upon throwing the last switch, I heard . . . nothing but the cacophony of the 80 meter Novice band on Saturday night. It crashed in on me. I had been rejected because I was obviously a lid.

Not to give up *too* easily, I tried it again about a week later. This time I was smart enough to pick the middle of the afternoon on a weekday. I called CQ in the midst of quiet. Again someone came back. Before tension overwhelmed me, I managed to copy his callsign. When he came back after I transmitted again, I didn't copy much except random letters and a few words here and there. I asked him to slow down, but he came back at about the same speed, as far as I could tell. Then I asked him to slow down again, and he came back at about the same speed. After another request to slow down, he was gone. Just a seemingly dead band with nothing going on.

That confirmed my suspicion. I couldn't copy code well enough to be on the air, and I couldn't build equipment. I thought I might as well give up, and that is what I did.

A few weeks later I returned the transmitter saying that I had lost interest. How could I admit I was incompetent where such matters were concerned? There was a look of sorrow on my mentor's face. Nine months later my Novice license expired, and my fate was sealed. (In those days the Novice license was for a term of one year with no renewals or retesting—i.e., one per lifetime.)

Seven years, two colleges, 600 miles, and one wife later, I found myself wanting to try it again. My parents shipped my receiver to me, and I built a transmitter from a kit. The engineer had done the layout, so it worked fine, and I learned a lot about building equipment by building kits first. By that time the rules had changed so that you could get a new Novice license if you hadn't held a license in the last year. I certainly qualified there.

My wife's boss was a General; he gave me the test. Shortly after my ticket arrived, we were back in West Virginia with my parents. My high school buddy Clark, WA8UUY (now W8TN), came by. Naturally, he wanted to know how I was doing. When I told him I hadn't made any contacts yet, he just smiled and said he knew what to do.

Before I knew what was going on, he had ushered Sally and me out to his car

\*7 Brian Rd., South Windsor, CT 06074



and on to his house. Within a few minutes his radio was warmed up. Meanwhile, he had typed out a script of the contact that I was about to have. I protested that he couldn't possibly know what was going to be said by the other party. Sure he could, he said, because just about all Novice contacts start out with a "formula." Most terminate at the end of the formula, too.

Having tuned up and down a bit, he found someone calling CQ. "OK, plug his callsign in the script here," Clark said. "Now call him." I did, and he came back to me.

"What's he sending?" I cried in panic. "Just follow along as best you can on the script. I'm copying, too, just in case he throws a curve."

Well, I didn't even manage to follow the script all that well during his first transmission. Clark told me to get ready. I heard a "K," and Clark said to send this part of the script. Before I got out his call-sign, Clark was telling me to slow down. Again, he told me to slow down. In my agitated state, that wasn't very easy, but I did. Pretty soon I was listening to the other fellow's code—and copying most of it!

We finished that script QSO, and then Clark found another one for me to work. By the next evening Clark and Sally were chatting away behind me while I was making the contact. Once or twice I needed help, and he was there.

After the first evening's workout, Clark explained a few things to me. The big thing that gets in the way of most new Novices is nerves. Making a contact is something new and frightening for many people. When you are frightened, you lose the ability to copy code very well, and your sending speed tends to go up. The other (more experienced) operator is going to attempt to send at your speed, unless it is too fast for him. So if you want him to send slowly to you, you better *send slowly to him!*

Clark didn't mention it, but what he was saying has a very sound basis in biology. Every human being is equipped with a biological program called the Fight or Flight Syndrome. Deep in the base of your brain is an area that's called the Reptilian brain, because it is about as sophisticated as the average reptile's brain. In cases of danger (new, unusual, frightening situations fall into this category according to its thinking), this part of the brain takes over a lot of the body's functions. Adrenaline is dumped into the blood stream, blood pressure becomes elevated, and thinking is focused on running away or fighting.

Under those conditions, you probably are going to be sending code about 25% faster than you think you are (muscle action is speeded up). At the same time, the parts of your brain that would normally copy code are pretty much shut down. Is it any wonder that my first contacts way

back when were a disaster? It had nothing to do with my worthiness as a ham. Had I stumbled through a few more contacts, I would have gotten over the "nerves" to the point where some part of my brain other than the reptilian portion would have been in charge.

Just about everybody's first few contacts are "failures" from the perspective of completely understanding what was being said and responding appropriately. The difference in successfully failing and unsuccessfully failing, then, is simply whether you quit or not. *There aren't any failures at amateur radio, just people who quit before they have a chance to succeed.*

Suppose you haven't made that plunge yet, or you tried the water and found it too icy. Here are some things to do and, especially, to keep in mind. Your goal in the first few contacts should simply be to relax and *muddle through*. If you are having a lot of difficulty with relaxing, there are lots of paperback books on the market that teach you very effective techniques for learning to relax. *Psychocybernetics* by Dr. Maxwell Maltz and *The Silva Method* by Jose Silva are two of the best.

Make the first few contacts as easy on yourself as you can. Find a local amateur who can copy code—not all can in spite of what their license may indicate—and who is patient with people. Ask him/her to help you through the ordeal. Set up two scripts in advance with blanks for the other person's callsign and name. One is for you answering a CQ, and the other is for someone answering your CQ. Type or print clearly. (I've included an outline of a sample QSO at the end of this article.)

If you are not able to find a local amateur to help you through your first few QSOs, then do the next best thing. In addition to preparing with the scripts, obtain a tape recorder that you can use for a few days. Tape record each QSO; then listen to it after the contact is over. I know some DXers who use this technique along with memory keyers to work those rare countries.

Should you miss some part of the other person's transmission, stay calm (well, you know what I mean). If you missed the information because the other operator was sending too fast, then slow down yourself. Just send "SRI MISSED UR (name, QTH, number of children, IQ, or whatever it was you think you missed)." Many amateurs send "R R R" or "SOLID SOLID" at the start of each transmission to indicate that they *received* 100% of the transmission (solid copy). Avoid falling into the trap of sending something like this "OK BILL SOLID BUT SRI I MISSED UR QTH. PLEASE REPEAT." Remember to go back over your tape recording at the end of the contact.

Avoid any concern if you didn't understand an abbreviation or some of the words. In fact, it may not even have been

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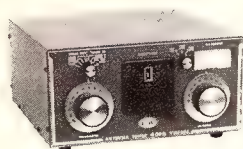
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## Script for Sending CQ

CQ CQ CQ DE KB1N KB1N KB1N K

(Listen for station responding to my CQ.)

———DE KB1N BT R R R TNX FER CALL

UR RST IS 599 UR RST IS 599

QTH IS SOUTH WINDSOR CT QTH IS SOUTH WINDSOR CT

NAME IS PETE NAME IS PETE

HW CPY? ———DE KB1N K

(Other station will send same information to you.)

———DE KB1N SOLID SOLID (If not, ask for repeat.)

RIG HERE IS KENWOOD TS 830 RIG IS KENWOOD TS 830

ANT IS DIPOLE ANT IS DIPOLE

IVE BEEN A HAM 15 YEARS IVE BEEN A HAM 15 YEARS

HW CPY? BT ———DE KB1N K

(Other station sends same information with maybe age or occupation thrown in.)

———DE KB1N R R R OK (name of other op)

UR RIG DOING GUD JOB HERE YOU HAVE FB SIG BT

I AM BEING CALLED TO BREAKFAST (etc) TNX FER REAL FB QSO

HOPE TO WORK YOU AGAIN GUD LUCK 73

———DE KB1N K

(Let the other station finish the contact. Take a break; you deserve it.)

## Script for Answering CQ

(You hear station calling CQ)

———DE KB1N KB1N KB1N AR

(Other op hears you and responds with information similar to above script.)

———DE KB1N R R R TNX FER GUD SIG REPORT, (name of op)

UR RST IS 599 UR RST IS 599

QTH IS SOUTH WINDSOR CT QTH IS SOUTH WINDSOR CT

NAME IS PETE NAME IS PETE BT

HW CPY? ———DE KB1N K

(Other operator responds with station information, etc.)

———DE KB1N FB SOLID (If not, ask for repeat.)

UR RIG DOING GUD JOB HERE BT

RIG HERE IS KENWOOD TS 830 RIG IS KENWOOD TS 830

ANT IS DIPOLE ANT IS DIPOLE

IVE BEEN A HAM 15 YEARS IVE BEEN A HAM 15 YEARS BT

HW CPY? ———DE KB1N

(Other operator comes back and tells you he must close or gives you his age, occupation, and marital status or similar personal information. Assume he is saying good-bye.)

———DE KB1N FB ——— I MUST GO TOO TNX FER FB QSO

HOPE TO SEE YOU AGAIN GUD LUCK 73

SK ———DE KB1N (SK is used to indicate that last transmission of a QSO.)

These scripts have information appropriate for the author. Be sure to substitute your information when you make up your scripts. Blanks indicate places for other station's callsign unless otherwise noted. Extensive lists of abbreviations and Q signals can be found in *Tune in the World*, *The ARRL Operating Manual*, and other ARRL publications. Until you've gotten your feet wet, stick to the simple ones used here. Underlined groups of letters are sent as one character without a space between them. More experienced CW operators will dispense with most of the repetition, but it is a fairly common practice in the Novice bands.

an abbreviation; simply, the operator on the other end may be a terrible speller. Remember, your goal for the first few contacts is just to muddle through. After you've calmed down a bit, then you can start to think about polishing your act.

What if you commit a blunder with the other operator? No big deal. I did and lived to tell about it. It was a warm spring afternoon with lots of static crashes. Three times I missed the other operator's name, and three times I went back to him with "SRI OM I MISSED UR NAME AGAIN PLEASE." The fourth time he came back with "NAME IS JANE NAME IS JANE NAME IS JANE I AM A GIRL NOT AN OM I AM A GIRL NOT AN OM I AM A GIRL NOT AN OM." Everybody has done something


silly one time or another. Laugh it off. The other person will, and then they will forget about it.

Until you've gotten to the point where a contact does not give you the jitters, limit yourself to one or two contacts per session. As soon as you've finished the contact, do something physical to get rid of the unwanted chemicals your reptilian brain has dumped into your system. Fight or Flight means just that. Walk vigorously around the block or do some aerobics. You'll feel much better then.

Set a goal of one or two contacts each day until it is comfortable. Stick with it. Keep doing it until you get it right. Right simply means that making a contact no longer frightens you.







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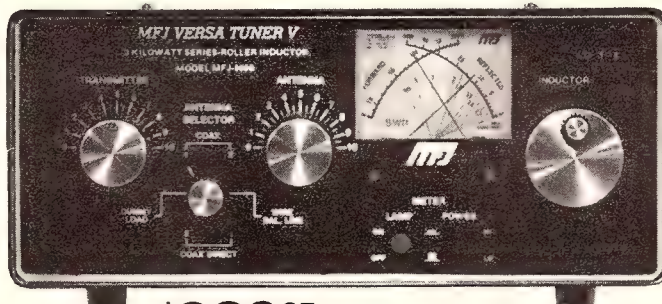
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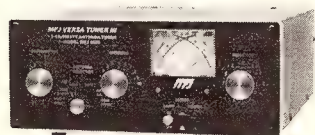
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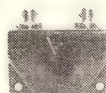
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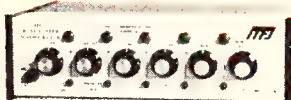
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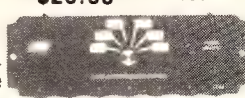
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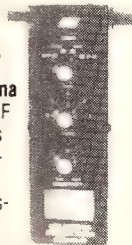
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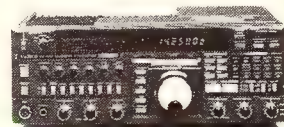
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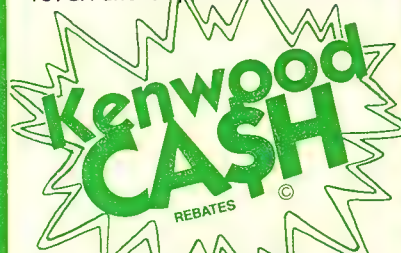
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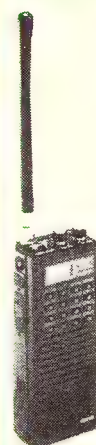
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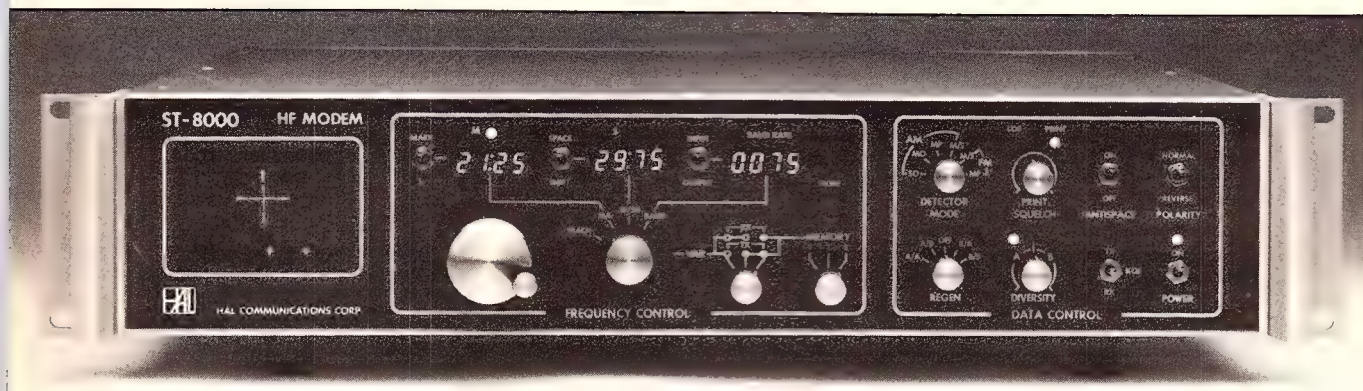
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## The HAL Communications ST-8000 HF Modem (Modulator Demodulator)



*The HAL ST-8000 HF Modem.*

Let's face it, gang, the world of amateur HF demodulator development has not had a lot to get excited about lately. Nothing within the last few years has brought about the excitement and revolutionary concepts as during the days of the demodulator pioneers making use of Nyquist's theorems (this gentleman actually established principles in 1925 from which many of our demodulator concepts were derived).

We have seen years in which development in demodulators has been focused on creating easy hardware and user interfaces to both the computer and the radio. Yep, it was only a couple of years ago when the only hardware interface demodulator offered was the high-voltage current loop. If you wanted to go another route you had to be a "technical hardware genius." The home computer became available, and most of us were trying to learn what a home computer was—NOT HOW TO INTER-FACE TO IT. Hence, manufacturers put great emphasis on interfacing and little on improving performance.

The modern-day demodulator makes extensive use of the XR2211—a demodulator on a chip. Its basic design needs very little improvement to provide a demodulator which will do a good job under 85% of HF RTTY conditions. A lot of users would be happy with this performance and never know the difference. Many of the "old timers" who are quite serious about their RTTY and use it daily for extensive traffic handling under many adverse signal conditions still swear that their old DT-600s, ST-6s, etc., do a better job than most of the current demodulators on the market.

Well, folks, it's the mid 1980's and time for another change—the time of the microprocessor, the age when we see everything being improved by the computer. The HAL ST-8000

is a new entry on the HF modem/demodulator market and makes use of a microprocessor to control and optimize its detection scheme parameters. Its vast assortment of operator enhancements and wide frequency and baud range enable it to be used for reception of RTTY, CW, and Packet and Sitor Signals. Complete control of filter bandwidths as well as Q are parameters to which in the past the user has had only limited access. Usually these parameters are optimized for only one baud rate and signal condition. The ST-8000 also boasts another major feature in its computer interface. An RS-232 input provides a medium for automation of parameter selection. This interface means you can connect a personal computer or a dumb terminal through a serial port and control all the parameters of the ST-8000. Let's take a look at its features, design, and performance.

### What Does A HAL ST-8000 Provide?

The HAL ST-8000 provides reception for signals which have a data rate from 10 to 1200 baud for a frequency range of tones from 400 to 4000 Hz. No, not in fixed baud (45, 50, 74.2, etc.) and frequency (2125, 2295, etc.) jumps like most demodulators, but continuous tuning in 1 Hz and 1 baud steps. Five modes of signal detection are offered by the ST-8000. These include Mark/Space differential as well as digital multi-path correction. (We will detail these detection schemes later.) The ST-8000 offers four input bandpass filters, three of which are tunable and provide center frequency tracking from 400 to 4000 Hz. Other filters include those after the limiter and AGC stages. These Mark and Space filters are matched 4-pole active devices each of which can provide 16 possible signal bandwidths. These filters can automatically track the baud and Shift rate selected. As with the other filters, the user also has manual control of these parameters. The final

stage filters are separate Mark and Space signal, seven-pole, matched, tunable, low-pass filters.

The user also has 1 Hz increment control over Space, Shift, and center frequency parameters. Eight nonvolatile and programmable memories are provided. You can save the Mark and Space receive filter frequency, Center frequency, Shift, input and output Baud rate selection, and Mark and Shift AFSK transmit frequencies. Another memory is used to save the current parameters in use when the ST-8000 is powered down. Other signal processing includes complete ASCII or Baudot regeneration for speeds of 45 to 1200 baud. Diversity is included to provide for two receiver selection diversity; signal clock recovery output is also available. Complete remote control over all parameters is included through an RS-232 interface that can run 300 through 9600 baud. Through this computer input, infinitesimal control of key performance parameters can be tailored to signal conditions by the user. The computer interface allows the user to generate test messages and set Selective Call functions for print as well as motor control of an external device.

The HAL ST-8000 radio interface includes audio input and audio output selection of matching impedance coupling of either 8 or 600 ohm balanced or unbalanced transformer coupling or DC isolation. PTT control can be relay closure to ground, internal automatic or terminal KOS, RS-232C RTS, or manual front-panel switch. RS-232 support, as well as TTL and MIL-188C support, is provided. FSK TTL support is also included. In other words, you can hook almost anything you want to this demodulator. It is interesting to note that the ST-8000 does not support high-voltage loop connection. We couldn't find a way to get smoke signals into it either.

Memory and detection mode selection, as

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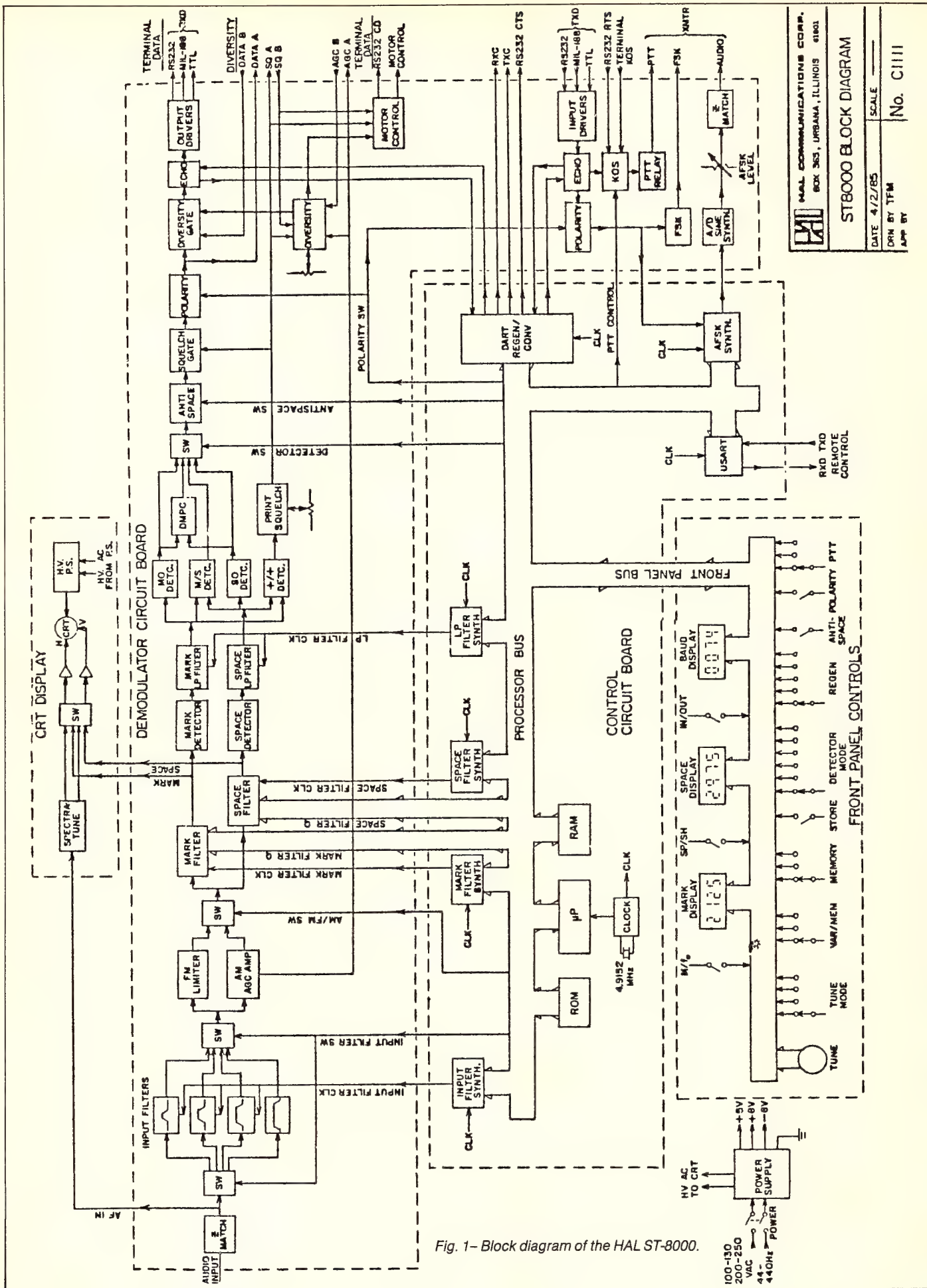


Fig. 1- Block diagram of the HAL ST-8000.

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	<b>ST8000 BLOCK DIAGRAM</b>	
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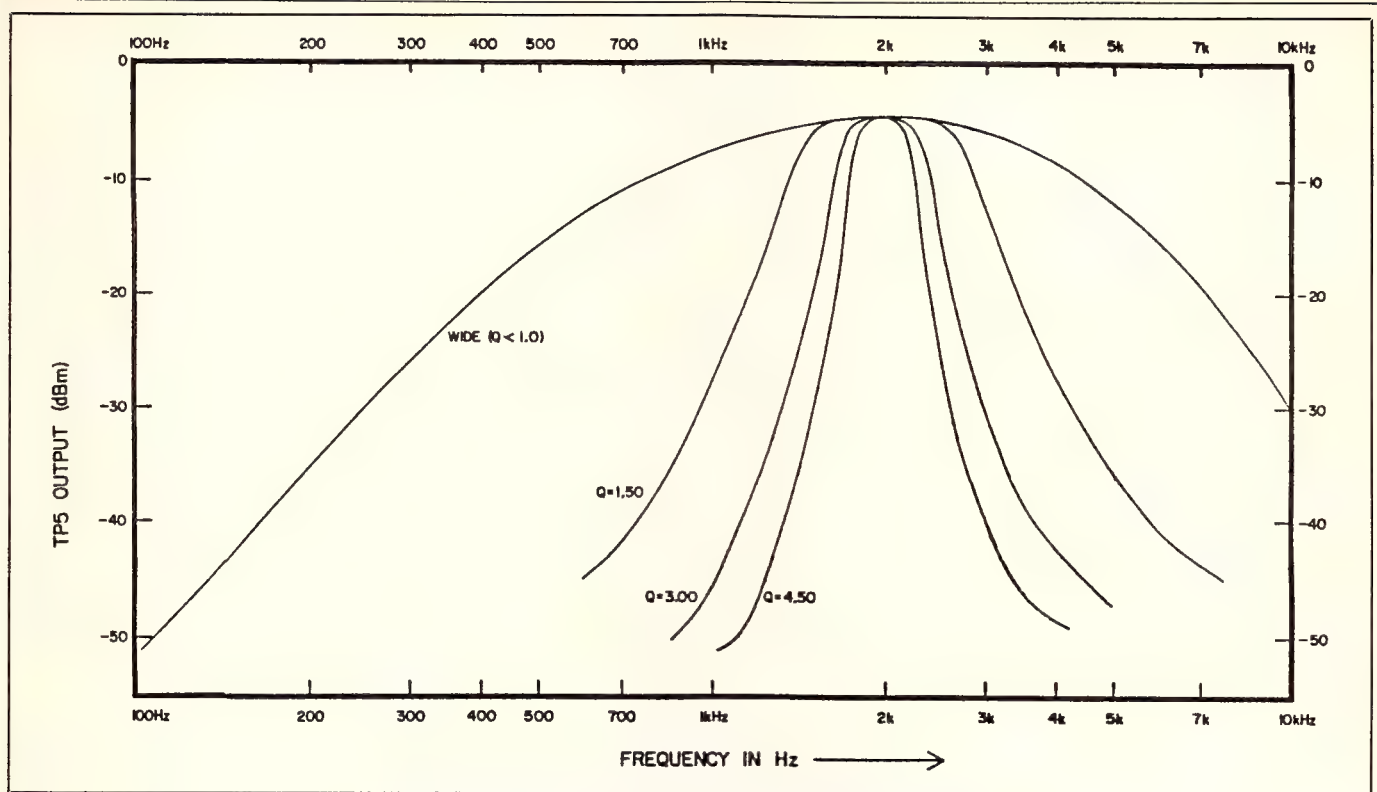


Fig. 2—The response characteristics for the SCF input filters.

well as individual parameter selection, is facilitated via the front-panel display. Three four-digit displays show Mark or Center frequency, Space or Shift frequency, and Input or Output Baud frequencies. LED indications of Mark, Space, Loss of Signal condition, Print on, A or B Diversity selection, and transmitter PTT are provided. The front panel also offers a unique tuning system in a crossed-ellipse CRT Mark/Space scope as well as a 500 to 3500 Hz wide band signal tuning indicator. This Spectra Tune (as HAL calls it) offers a new approach in allowing the user to visualize adjacent channel interference. You can instantly see how changes you make in receive filtering, etc., affect the spectrum around the RTTY signal. Spectra Tune is a registered trademark of HAL Communications.

## Detection Modes

Two main modes of operation are provided by the HAL ST-8000—Hard-limiting FM or AGC-controlled AM signal processing. Both modes are always operating with the user determining which mode is actually being used for signal processing. HAL went to extremes to ensure outstanding sensitivity and dynamic range (spec to be  $-65$  to  $+10$  dBm). The detector modes offered from these two schemes are as follows.

For the FM mode the following detector schemes can be used:

1. **Mark/Space**—Used when heavy fading of both Mark and Space tones occurs.
2. **MP**—Multi-path distortion correction. Used during multi-path distortion when the received Mark and Space tones have a considerable overlap in timing. This circuit corrects for this overlap. Works well when heavy fading is occurring also.

For the AM mode the following detector schemes can be used:

1. **Mark/Space**—Used during strong adja-

cent channel interference conditions or when heavy fading of both Mark and Space tones is occurring.

2. **MP**—This mode offers enhanced copy during conditions of strong adjacent-channel interference and when multi-path distortion is occurring.

3. **Mark Only**—This mode offers copy from the Mark tone with no signal being processed from the Space tone. This mode is also used for CW copy by the ST-8000.

4. **Space Only**—Same as Mark only except uses only the Space tone for copy.

## How the ST-8000 Modem Works

Let's take a general look at how the ST-8000

gets the job done. We will be pointing out some of the limits imposed in the past demodulator design and how the ST-8000 puts these controls into the user's hands for optimization. Please refer to fig. 1 for a block diagram of the ST-8000.

The audio input (on the left of fig. 1) is diode protected for overload conditions. As we mentioned earlier, allowance is made for this input to be impedance matched to the output impedance of the receiver. This is dip-switch selectable from the inside of the cabinet of the ST-8000. It should be noted that the receiver audio output is also provided unaltered to the spectra display, hence providing the user with the frequency spectrum surrounding the signal he is trying to copy.

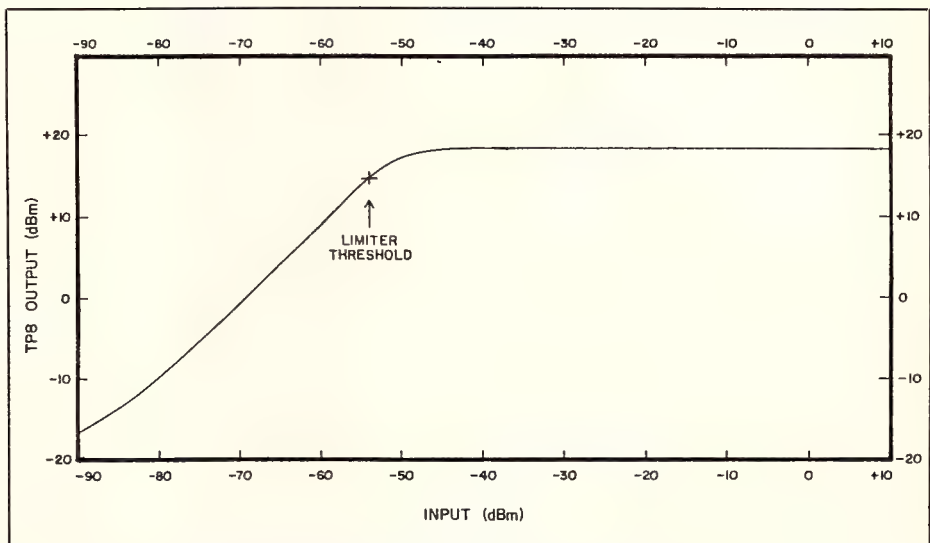


Fig. 3—The FM limiter performance curve.



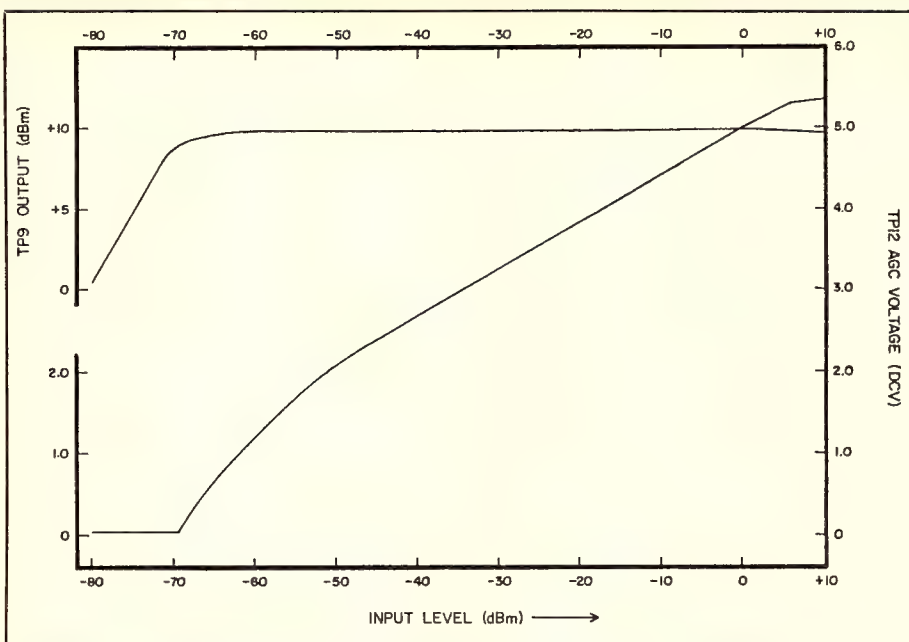


Fig. 4—The AGC amplifier performance curve.

Before we go any further, let's talk a minute about the filter circuits being used in the ST-8000. The HAL ST-8000 uses monolithic switched-capacitor (SCFs) filters to provide tuning capability of its filter stages. These filters exhibit a wide frequency range while maintaining near constant Q and filter skirt shaping. To ensure filtering of clock frequencies from the microprocessor which are used to set the filter parameters, two-pole active low-pass filters are used before and after each of these switch capacitor filters. These low-pass filters serve a dual function by also improving overall selectivity. Now back to following the audio signal.

The audio signal is next put through a 5 dB

gain amplifier which also provides isolation. Then three different SCFs or one fixed tune filter can be chosen to filter the signal. Fig. 2 shows an example of the bandwidths afforded by these filters. They exhibit Qs of 1.5, 3, and 4.5. The wider fixed tune low-pass filter (processes signals from 380 to 4200 Hz) can be used for wide Shift and high-speed RTTY data rates. This curve is also shown in fig. 2. Okay, so now we have the signal going through either of four possible filters. This is where the beauty of the microprocessor comes in. When the user selects Mark, Space, Shift, and Baud rates for the signal he is receiving, the microprocessor automatically selects the optimum filter. When the user is working through the

computer interface to control the parameters of the ST-8000, filter selection can be made manually.

Next the "filtered" signal comes to the hard FM limiter stage and the AM AGC stage. As we pointed out earlier, both schemes are constantly working with the user selecting which one will be used for signal processing. An electronic switch is used to select which one. The hard-limiting FM has a spec threshold of -54 dBm and the AGC AM has a spec threshold of -65 dBm. Fig. 3 is a display of the wide dynamic range the ST-8000 exhibits with limiter output occurring at signal inputs of less than -70 dBm. Fig. 4 shows the AGC AM voltage output versus receive signal input. From the sensitivity figures the ST-8000 ought to be an outstanding performer when it comes to selective fading.

Next the signal is processed by identical Mark and Space four-pole SCF discriminator filters. Exact center frequency setting of both filters is controlled by the microprocessor. It should be noted that the bandwidth of these filters is also automatically set by the microprocessor for the baud speed received. Thirty-two different (32.7 to 1.9) Qs can be selected to choose the shaping of these filters. Fig. 5 is an example of the high Q range filter shapes available. Selection of these bandwidths is divided into two ranges. This is the place where performance was lost in other demodulators, since this bandwidth is usually fixed for one common data rate. Deviation from this fixed rate results in loss of performance.

Okay, now that we have filtered, processed, and shaped our Mark and Space signals, the next step is detection. Diode detectors with a dynamic range greater than 40 dB are used for this step. After these detectors, identical seven-pole SCF low-pass filters are used for both the detected Mark and Space signals. Again, these filters' cutoff frequency is computed by the microprocessor according to the speed of the input signal. This is again another place where the ST-8000 doesn't compromise on

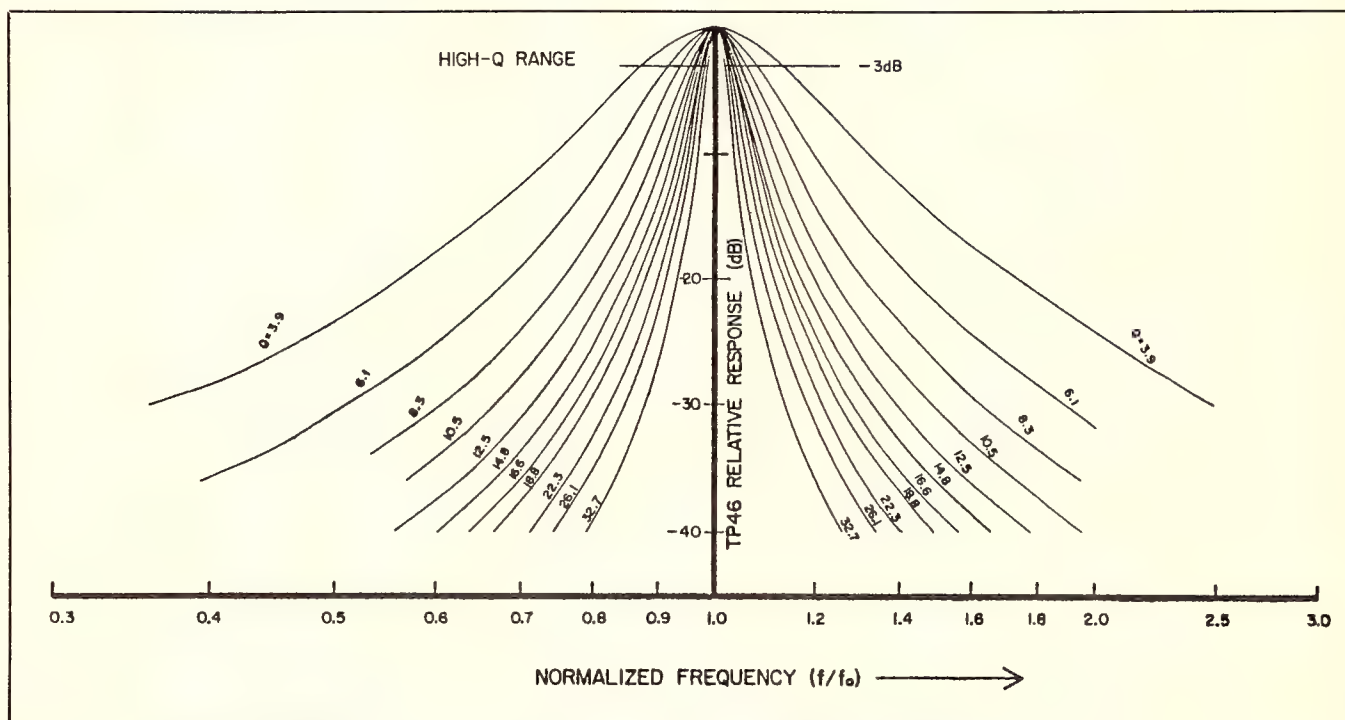


Fig. 5—The discriminator filter (High-Q Mark) bandwidth.

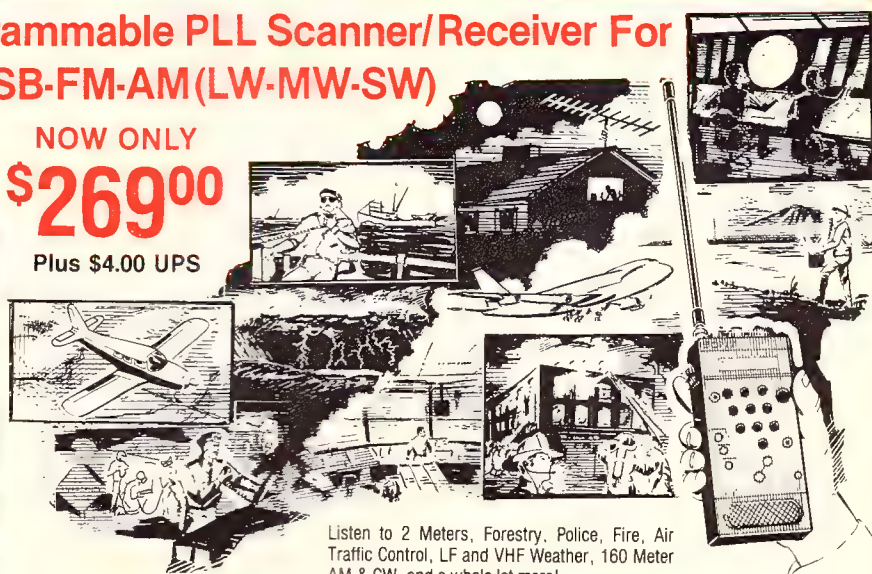


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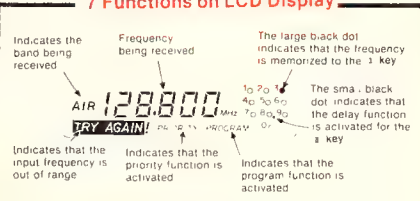
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### 6 Frequency Bands

Band	Frequency range	Tuning interval
PSB	144 - 174 MHz	5 kHz
AIR	108 - 136 MHz	25 kHz
FM	76 - 108 MHz	50 kHz
AM	SW 1601 - 2194 kHz (1603 - 2194 kHz)	1 kHz
	MW 530 - 1602 kHz (531 - 1602 kHz)	10 kHz (9 kHz)
	LW 150 - 529 kHz (150 - 530 kHz)	1 kHz

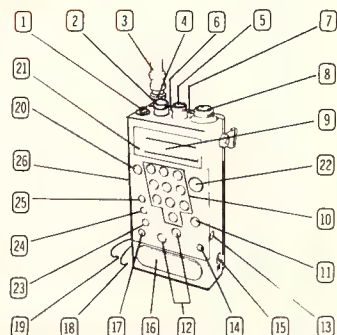
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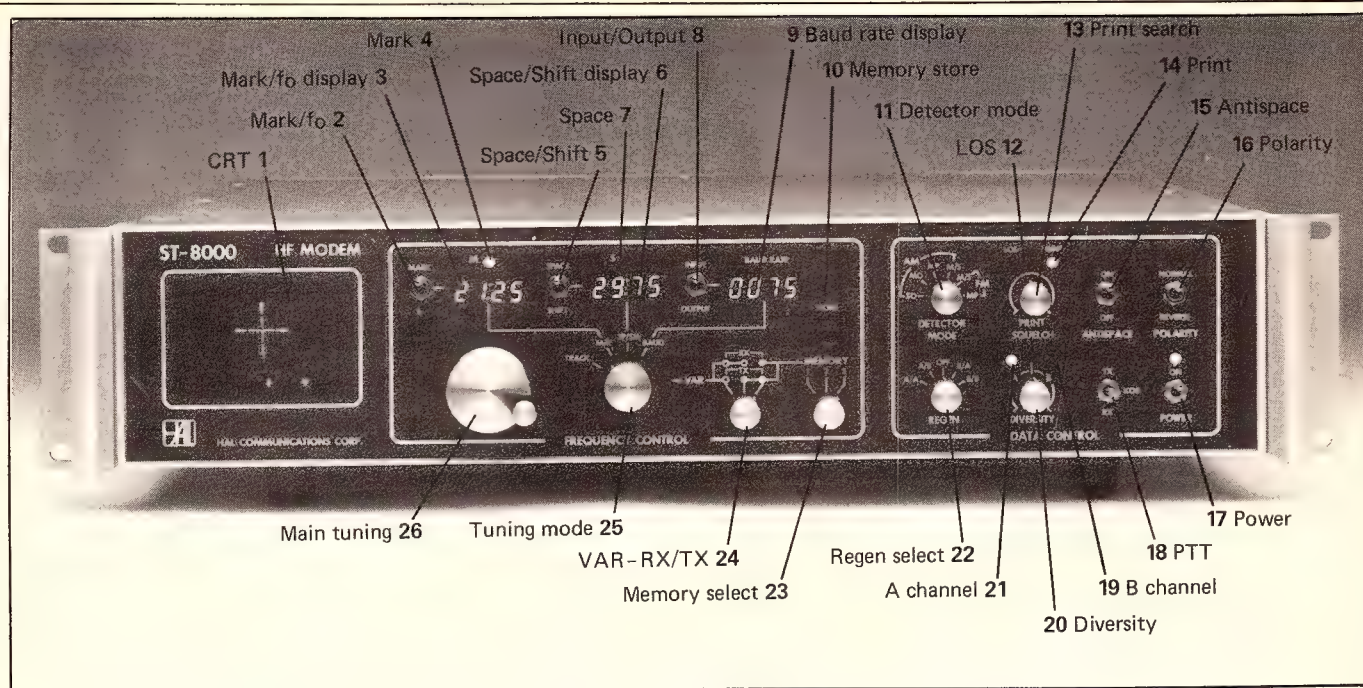


Fig. 6—Front-panel view of the HAL ST-8000. The callouts are described in the text.

performance. Other demodulator schemes depend on one setting to cover all speeds. These signals are next passed to one of the four possible detector modes.

The next stage of the demodulator portion of the ST-8000 is what they call the pulse detectors. Two pulse detectors are for the Mark and Space signal only. Another available detector is the Mark/Space detector which literally combines the Mark and Space low-pass filter output and regenerates the Mark and Space waveforms. For the Mark and Space detectors each circuit is identical except for polarity. True square-wave formation is performed on each waveform at this point. The circuitry literally creates a square wave from each signal, taking into account its previous shape and correcting for possible distortions due to signal fading. The Mark and Space detectors' outputs are next used for the multi-path correction circuitry. The final detector (remember there are four) is for print squelch control which detects when valid information is being received and should be printed.

As we mentioned earlier, the separate detected Mark and Space signal outputs are applied to the Digital Multi-Path Correction Circuit (DMPC). This circuit takes into account and corrects for signal smearing. This phenomenon, called multi-path distortion, plays havoc with RTTY signals and occurs quite often on HF. Auroral effects, as well as the signal arriving at your receiver from two different paths, contribute to multi-path distortion. The effect is to literally change the timing and frequency range of the RTTY signal. Mark and Space tones smear over each other.

Before we leave the technical area of the ST-8000, it may prove beneficial to look for a minute at the Dual Diversity system offered. This mode of operation involves the use of two HAL ST-8000s to copy either the signal on one frequency using different antennas or to copy the same signal that is being generated on two different frequencies at the same time. HAL calls it the Infinite Resolution Diversity circuit. This circuit samples the signal strengths and

print squelch condition of both ST-8000s and chooses the ST-8000 that has the greatest signal strength. If signal conditions between both units exceed 5 dB, the sampling rate and switch rate are increased to ensure prompt and accurate switching. A front-panel control allows the user to vary the decision point of which unit has the stronger signal. This allows tailoring the ST-8000 logic to favor one channel over the other due to perhaps antenna placement, receiver sensitivity, etc. It should be pointed out that the print squelch circuitry associated with the Diversity circuitry is different from the normal print squelch offered by the ST-8000. This one works off input signal amplitude to the demodulator. The normal print squelch routine in the ST-8000 works off the principle that valid Mark and Space signals must be received before output from the ST-8000 to the terminal is activated. Hence, you are provided with two mechanisms to ensure only valid signal copy is printed.

### The ST-8000 Microprocessor

The microprocessor used in the ST-8000 which provides so many of the automatic control functions and gives the unit its flexibility as to filter and receive scheme optimization is the Z-80A. The common system clock is 4.9 MHz with the Z-80A clock divided down to 2.45 MHz. EPROM size is 16K for the firmware with 2K of ram memory. Both memory and I/O mapping are used to control the demodulator's circuits. In summary, six separate frequency synthesizers are used for setting Mark, Space, and all the low-pass filter constants. Any changing of a front-panel control requires the microprocessor and firmware to reselect the bandwidth and Q of the various filters for optimal copy.

### Front-Panel Operator Interface

Let's take a look at the front-panel operator interface. Since you have a microprocessor optimizing all the circuitry and parameters for you for each speed or frequency change, you

can set your normal RTTY selection parameters and let the ST-8000 do the rest.

Please refer to fig. 6 for a look at the front panel of the ST-8000. The front panel is divided into three areas—CRT Display, Frequency Controls and associated displays, and Data Controls.

**1. CRT**—This is the Spectra-Tune display and the scope ellipse pattern tuning indicator. It is hard to beat a scope for tuning of RTTY signals. CRT saver circuits which deflect the scope pattern off the screen are included to ensure the phosphor of the CRT is not burned. This feature is controlled by the Print Squelch and Non-Diversity AGC Squelch controls. Manual control is offered by issuing a command from the computer connected to the terminal interface as well as the switching to ground of one of the control lines of the back of the ST-8000. Also, the CRT is automatically deflected off screen if a valid RTTY signal is not received or if a continuous Mark pulse is received for 10 seconds. HAL offers the feature of instantly bringing back the pattern for 10 seconds if the user changes any of the front-panel controls.

**2. Mark/Center Frequency Display Switch**—This switch controls what is seen on the 4-digit frequency readout display (number 3).

**3. Frequency Display**—Shows either the Mark frequency or the center frequency of the ST-8000 receive filters in Hz. (It should be noted that the 3 frequency displays are red 4 × 7 segment LED displays.)

**4. Mark LED**—Shows reception of Mark signal.

**5. Space/Frequency Shift Display Switch**—This switch controls what is seen on the 4-digit readout display (number 6).

**6. Space Frequency/Frequency Shift Display**—Shows either the Space frequency or Shift frequency of the received filters.

**7. Space LED**—Shows reception of space signal.

**8. Baud Rate Input/Output Display Switch**—This switch controls what is seen on the 4-digit readout display (number 9).



**9. Baud Rate Display**—Shows either the incoming signal baud rate or the ST-8000 output baud rate (regeneration).

**10. Memory Storage Pushbutton**—Used to manually store sets of ST-8000 parameters in one of 8 memory slots available. This is the operator front-panel interface to initiate storing of particular ST-8000 parameters in non-volatile memory. The frequency displays will blink on and off to indicate when the parameters have been stored.

**11. Detector Mode Selector**—Allows for user selection of Space Only, Mark Only, Multi-path, and Mark/Space reception modes as well as either AM or FM processing schemes.

**12. Loss of Signal LED**—Indicates when both Print Squelch and Diversity Print Squelch circuits have sensed loss of signal.

**13. Print Squelch Level**—Allows operator to set Print Squelch threshold level.

**14. Print Indicator LED**—Shows when incoming signal is being printed.

**15. Antispace Switch**—Allows operator selection of Antispace feature. This feature is optimized for speeds of 45 to 150 baud. It stops the ST-8000 from continuous spacing printing when receiving only a continuous Space tone.

**16. Receive/transmit Signal Polarity Switch**—Allows user to swap Mark and Space tone frequencies rapidly. Good for rapid shifting of tones when trying to receive unknown RTTY signals. It saves the user from having to change receiver sidebands.

**17. ST-8000 Power Switch.**

**18. PTT Control Switch**—Allows for user manual control of PTT circuits.

**19. B Diversity Channel LED**—Shows when B channel (second ST-8000 in Diversity Mode) is active.

**20. Diversity Control**—Allows user to tailor Diversity system to allow for differences in equipment used for each ST-8000. This control is used as a signal amplitude squelch control when used in a single ST-8000 configuration.

**21. A Diversity Channel LED**—Shows when A channel is active.

**22. Regeneration Mode Selection**—Shows what regeneration mode is being used. Selection is no regeneration, ASCII to ASCII, ASCII to Baudot, Baudot to ASCII, and Baudot to Baudot regeneration. The speeds are selected (control nine) by the user. The ST-8000 provides a 256-character buffer if the receive signal is faster than the regeneration output—i.e., you are receiving a 150 baud signal and regenerating it out to your terminal at 45 baud. If the 256-character buffer is overrun, there is no means to stop loss of data. RS-232 signal control can be used to prevent overruns when you are transmitting at a slower signal rate than your terminal is providing data. X-on and X-off flow control is also available to prevent this overrun.

**23. Memory Switch**—Provides user front-panel selection of which memory channel information is to be stored or used by the ST-8000. Although only three positions are shown, the control can be turned further clockwise for five more positions. These positions are meant for the computer terminal interface control but can be used and set from the front panel.

**24. Variable Receive/Transmit Switch (VAR R/T)**—This three-position switch allows the user to set receive/transmit tone frequencies, use of memory, and the ST-8000 front-panel segment display selection. If you look at the front-panel layout, the symbols used for this switch can be quite confusing. HAL is provid-

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ing quite an ingenious operator interface control with this switch. In the left position both the receive and transmit Mark and Space tones are as shown on the front-panel segment displays. When this switch is in the center position, the receive Mark and Space tones are set by the front panel, but the transmit Mark and Space tones are selected from memory as selected by the memory switch. When this position is selected, the front-panel frequency displays start serving a dual function. Since the transmit and receive Mark and Space tones can be different, these displays show the receive set of frequencies 70 percent of the time and the transmit set of frequencies 30 percent of the time. The transmit set of tones has a colon in the middle of the display to distinguish them from the receive set. If the (VAR R/T) switch is in the right-hand position, both transmit and receive Mark and Space tones are set by memory as chosen by the memory switch. Since you can store separate send and receive Mark and Space tones in memory, the segment LED displays show both using the blinking colon to indicate which are received and which are transmit.

Once you have an understanding of how the VAR R/T switch works, you can easily understand the legend on the front panel. But if you take the ST-8000 directly out of the box and start trying to work with this switch, get pre-

pared to sweep up your hair from around your operating area.

**25. Tuning Mode Switch**—This is the master switch which adds a great deal of flexibility to the user front-panel interface of the ST-8000. This switch controls the function of the main tuning knob on the front panel (number identifier 26). The first position is the TRACK position. When the tuning knob is turned, both the Mark and Space tone frequencies track each other in changing frequency. The M/fc position allows the user to change either the Mark frequency with the tuning knob or the ST-8000 filter's center frequency. The SP/SH position allows the user to change the Space tone either in terms of its frequency or by the changing frequency Shift. The BAUD position allows the user to change the Input and Output baud rates of the ST-8000.

#### 26. Main Tuning Knob.

As you can see, the front-panel interface of the ST-8000 provides a degree of flexibility that is hard to beat. One can easily become very spoiled with such enhancements.

### The Computer Interface To The ST-8000

As we mentioned earlier, HAL provided complete control (except print squelch and Di-

versity level) over all parameters of the ST-8000 through a computer terminal interface. A separate DB-25 that has the standard RS-232 connection is provided for this interface. Hence, you can use a personal computer, dumb terminal, etc., to set and optimize ST-8000 features. Asynchronous ASCII code data rates (set by dipswitch within the ST-8000) of 300, 1200, 2400, 4800, and 9600 baud are supported through this RS-232 interface with complete handshaking capabilities. It should be noted that this interface provides only input into and out of the control parameters of the ST-8000. Received signal data is not provided through this port. A separate DB-25 is used for printing of received text. The computer interface provides a complete user interface with error condition messages and user feedback.

The ST-8000 provides three modes of remote-control terminal operation—monitor, front panel, and direct control modes. In the monitor mode the user can only look at the individual parameter settings. In the Front Panel mode the user only needs to select the RTTY parameters concerning the signal he is copying—like Mark and Space tone frequencies, etc. The ST-8000 will automatically set the proper filter, etc., parameters—much like the front-panel interface. In the Direct Control mode the user has total control over filter Q and low-pass filter bandwidths regardless of which speeds or Mark and Space frequencies the ST-8000 is copying.

The Direct Control feature opens an exciting door in the world of HF modem capabilities. The user has complete control to maximize his demodulator to signal conditions and modes he is operating instead of living in a world of compromises that most demodulator users must make. As we mentioned in the theory section of this review, filter Q and bandwidth are often established for one fixed speed and set of Mark and Space frequencies. This compromise will get you through 90 percent of all signals copied, but when the copy is rough, control over these parameters can make a difference.

It should be pointed out that HAL has thought of many user interface features to make working with the ST-8000 computer interface easier. An example of this is the user can send more than one command on a line by use of the ";" character to separate commands.

Command availability is as follows (we are showing only the abbreviation of the command):

- FP—Set Front Panel Mode
- DC—Set Direct Control Mode
- H—List all commands and brief explanation
- EC—Remote terminal echo on or off
- ST—List all parameters as they currently exist
- STB—List Q and BW parameters
- STC—List switch settings
- STM—List memory parameters
- STQ—List Q and BW parameters
- STT—List tone parameters
- DM—Set detector mode—Mark Only, etc.
- AS—Set antiSpace mode
- PO—Set polarity
- REG—Set regeneration mode
- TR—Set Track mode
- MA—Set Mark RX frequency
- SP—Set Space RX frequency
- C—Set RX center frequency
- SH—Set RX shift frequency

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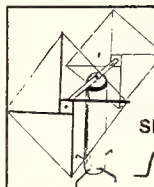
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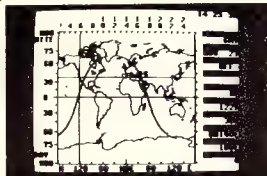


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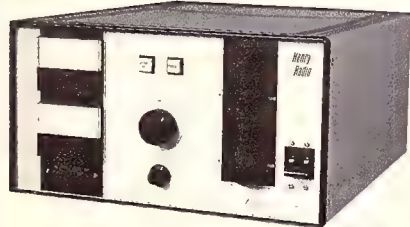
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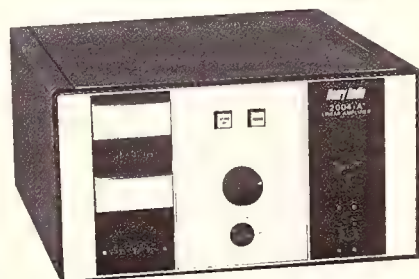
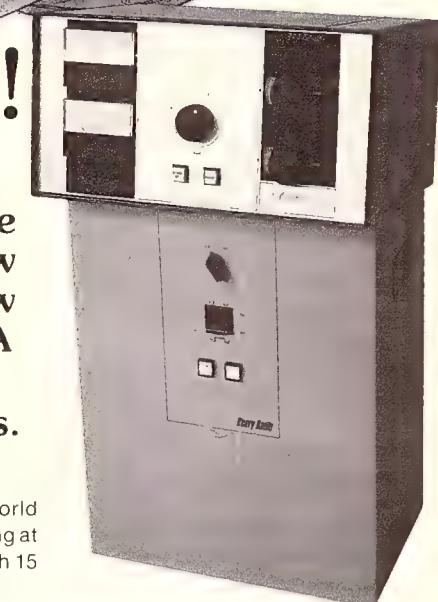
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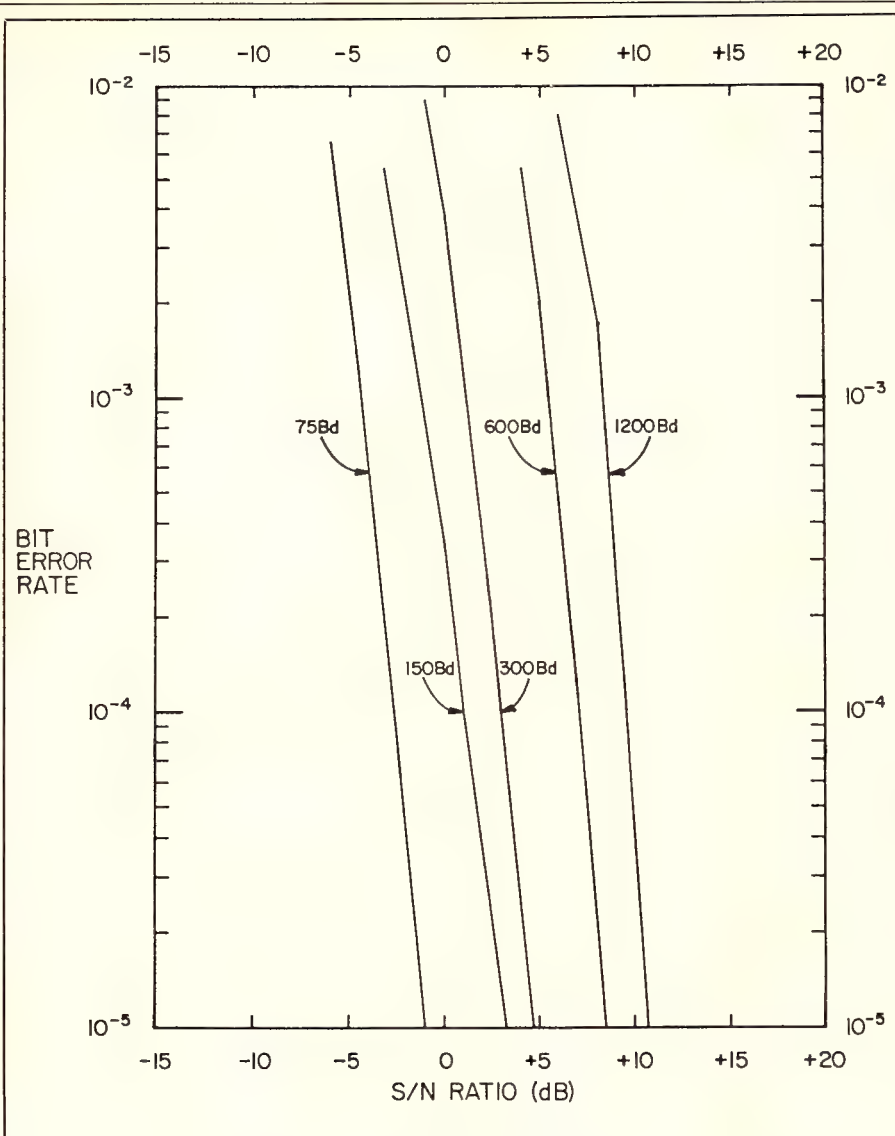


Fig. 7—Results of Bit Error Rate (BER) tests.

**EX**—Exchange RX Mark and Space frequencies  
**XMA**—Set TX Mark frequency  
**XSP**—Set TX Space frequency  
**XC**—Set TX Center frequency  
**XSH**—Set TX Shift frequency  
**TX =**—Set TX = RX frequencies  
**RX =**—Set RX = TX frequencies  
**TXL**—Lock TX to RX frequencies  
**QM**—Set RX Mark filter Q (32 discrete Q positions can be set 1.9–32.7)  
**QS**—Set RX Space filter Q  
**QI**—Set RX input filter Q  
**LP**—Set RX low-pass frequency  
**IB**—Set input baud rate  
**OB**—Set output baud rate  
**LIP**—Load memory parameters  
**SM**—Save Parameters to memory (allows you to set optimum Q, etc., parameters to be switch selectable from front panel)  
**QBF**—Forces ST-8000 to send QBF test message  
**RY**—Forces ST-8000 to send RYRY test message  
**SC**—Turn Selcal feature on  
**SCON**—Set selcal 10-character turn on sequence

**SCOFF**—Set selcal 4-character turn off sequence  
**SCC**—Select ASCII or Baudot as Selcal mode which must be received  
**PR**—Turn on/off defeat of SC and PR SQ  
**CR**—Turn on/off defeat of auto CRT screen saver  
**BYE**—No change exit  
**RES**—Full ST-8000 reset

It should be noted that HAL in the operator's guide provides complete instructions on how to optimize the ST-8000 parameters (Q, filter bandwidth, etc.) to make use of the computer interface capability. This capability opens the door to tailor-made external programming to the ST-8000 by the user to automatically adjust parameters for modes of operation as well as optimizing the ST-8000 receiving performance.

### The HAL ST-8000 Cabinet

The HAL ST-8000 uses an aluminum cabinet (3.5"H x 14"D x 19"W) with iridite plating to ensure good electrical shielding. The unit is RFI quiet and is spec and tested to exceed the FCC Part 15, Subpart J, Type B emissions requirements by more than 17 dB. Four circuit

boards make up the unit. The power supply (the ST-8000 only pulls 36 watts of power) is heat sunk, and the overall design was optimized for removing heat from the unit without the use of a blower. The cabinet and component layout were engineered so that convection currents through the ventilation holes are all that are needed. This is quite an accomplishment when you consider the number of components (we counted over 80 ICs and transistors alone) and the fact that it houses a CRT display and power supply. All boards are connected by plug and socket ribbon cables and can be folded out for easy service. The unit is made for 19 inch rack mounting or can stand on its front feet or push-up stand.

### HAL ST-8000 User Documentation

The HAL ST-8000 user operating manual is very complete, to say the least. The user is presented with explanations for every one of the parameters for tailoring his equipment to the ST-8000. Scenarios are offered that easily allow the user to set the parameters to his own equipment. Each external remote-control parameter is given a detailed explanation. Tricks of the trade in achieving high performance from the user tuning of the filter's Q and bandwidth are explained in great detail, which will allow even a novice at RTTY work to be able to use and optimize the ST-8000. You can purchase separately two technical manuals detailing the ST-8000. Volume one provides an in-depth technical look at each function of the ST-8000 as well as step-by-step procedures on trouble-shooting techniques and tuning procedures. The manual provides a parts reference number any time a component is detailed. A parts list in the back of volume one provides a listing of each reference number, description, drawing number, part number, and Federal Supply Code for Manufacturers number. A cross reference of the listed Federal Supply Code for Manufacturers is also included.

Volume two of the technical manual includes schematics of the ST-8000. On the page opposite each schematic is a picture of the board layout with the portion the schematic covers highlighted so the user can easily go from the schematic to a board position.

### Performance of the HAL ST-8000

When you talk about a demodulator or modem's performance, there are many opinions as to what is good performance. For each method of grading you can find someone else with another criteria or test environment which he considers to be the only true test of performance. HAL included in their technical manual Bit Error Rate tests they run on the ST-8000 to ensure performance. In these tests they subject the demodulator to a known signal strength and a random introduced amount of noise. This sort of testing is only good if large volumes of data are tested. HAL ran the tests on one million bits of data. For the test, the HAL ST-8000 automatically picked the low-pass filter's bandwidth and filter's Q by the input baud rate control just as it would if the user dialed a baud rate from the front panel. Signal level was -10 dBm with the noise varied from -10 dBm to 0 dBm. Fig. 7 shows the results of these tests at various speeds.

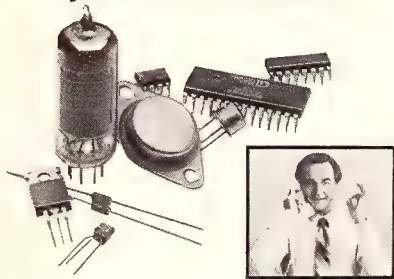
The ST-8000 has an amateur net price of \$2,895. The two-volume tech manual is an option selling for \$100. The equipment is produced by HAL Communications Corp., P.O. Box 365, Urbana, Illinois 61801.



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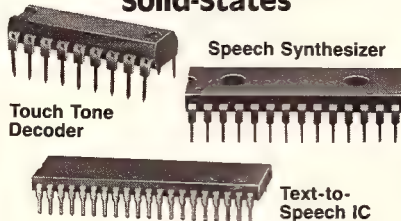
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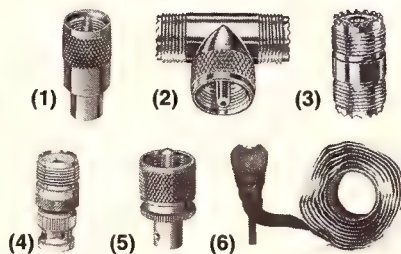


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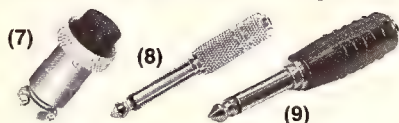
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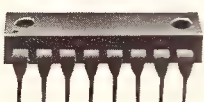
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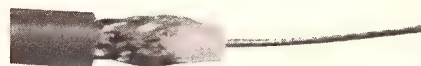
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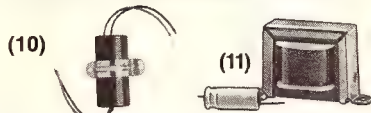
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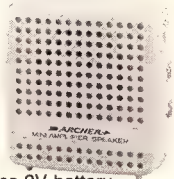


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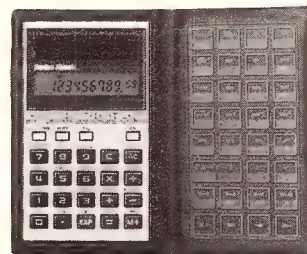


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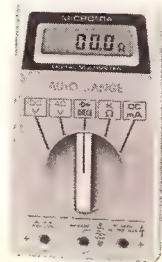


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## Announcing

# The 1987 CQ World-Wide 160 Meter DX Contest

**CW: January 23-25**  
**Starts: 2200 GMT Fri.**

**SSB: February 20-22**  
**Ends: 1600 GMT Sun.**

**W**ith many new countries having opened the 160 meter band for amateur operation but only in certain segments of the band, it has become impossible to effectively come up with a band plan that would be acceptable to everybody. However, that is no reason why we should give up the present DX Window. It is still essential that 1825 to 1830 kHz be kept free of U.S. and Canadian activity. DX stations that are permitted to use that segment of the band should not use it for one frequency operation. They should specify (QSX) a listening frequency for split-frequency operation. It is also suggested that 1907 to 1912 kHz be considered a "Window" for DX operation in certain areas (Japan, etc.).

Violation of the above concept will be considered "unsportsmanlike conduct," rating possible disqualification.

There are no changes in the scoring used the past few years. The Canadian multiplier has been clarified, and a new list of plaques and sponsors has been added.

**Classes:** Both single and multi-operator.

**Exchange:** RS(T) and QTH. State for the U.S. and areas for Canada. It is not necessary for DX to spell out their QTH.

**Scoring:** Contacts with stations within own country, 2 points. Contacts with stations in other countries but in same continent, 5 points. Contacts with stations in other continents, 10 points.

**Multiplier:** Each U.S. state (48), Canadian area (13), and DX country. Canadian areas: VO1, VO2, VE1 N.B., VE1 N.S., VE1 P.E.I., VE2, VE3, VE4, VE5, VE6, VE7, VE8 N.W.T., VY Yukon. KH6 and KL7 are considered countries, and the U.S. and Canada are not counted as a multiplier. A Maritime Mobile counts as a multiplier in each World Region. The ARRL DXCC and the WAE country lists, and the WAC boundaries, are the standards.

**Final Score:** Total QSO points times the sum of the multiplier (U.S. states + VE areas + DX countries). Maritime Mobile scoring will be determined by their location.

**Penalties:** Three additional contacts will be deleted for each duplicate, false, or unverifiable contact removed from the log. A second multiplier will also be re-

moved for each one lost by the above action.

**Disqualification:** Violation of the rules and regulations pertaining to amateur radio in the country of the contestant, or of the rules of the contest, unsportsmanlike conduct, or taking credit for excessive duplicate contacts or multipliers will be deemed sufficient cause for disqualification.

Disqualified stations or operators may be barred from competing in future CQ contests for a period of up to three years.

**Awards:** Certificates to the top scorers in each class, in each U.S. state, Canadian area, and DX country. Also the following plaques.

#### Single Operator

##### CW

World—by K5AAD  
\*U.S.A.—by N4PN  
Europe—by K4SB  
Asia—by WD4RCO

##### SSB

World—by K5AAD  
U.S.A.—by K4JRB  
Europe—by K5UR  
Oceania—Dixie DXers

#### Multi-Operator

World—by N4RJ      World—S.E. DX Club

The above plaques may be won once only by the same station within a two-year period. Winner of the World Plaque will not also win a sub-area award. That award goes to the runner-up of that area.

Sample log and summary sheets may be obtained from CQ by sending a large SASE with sufficient postage to cover your request. You can make up your own, 40 contacts to the page, columns for time (GMT), exchange sent and received, multiplier, and QSO points. Indicate the multiplier only the first time it is worked.

Include a summary sheet with your entry showing the scoring and other essential information and a signed declaration that all rules and regulations have been observed. Mailing deadline for CW entries is February 28th, and March 31st for the SSB section.

Logs can be sent directly to the 160 Meter Contest Director, Donald McClenon, N4IN, 3075 Florida Avenue, Melbourne, FL 32904 USA. They can also be sent to CQ 160 Meter Contest, 76 North Broadway, Hicksville, NY 11801 USA. (Please indicate CW or SSB on the envelope.)

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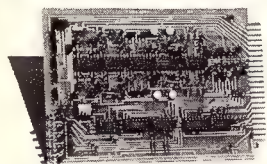
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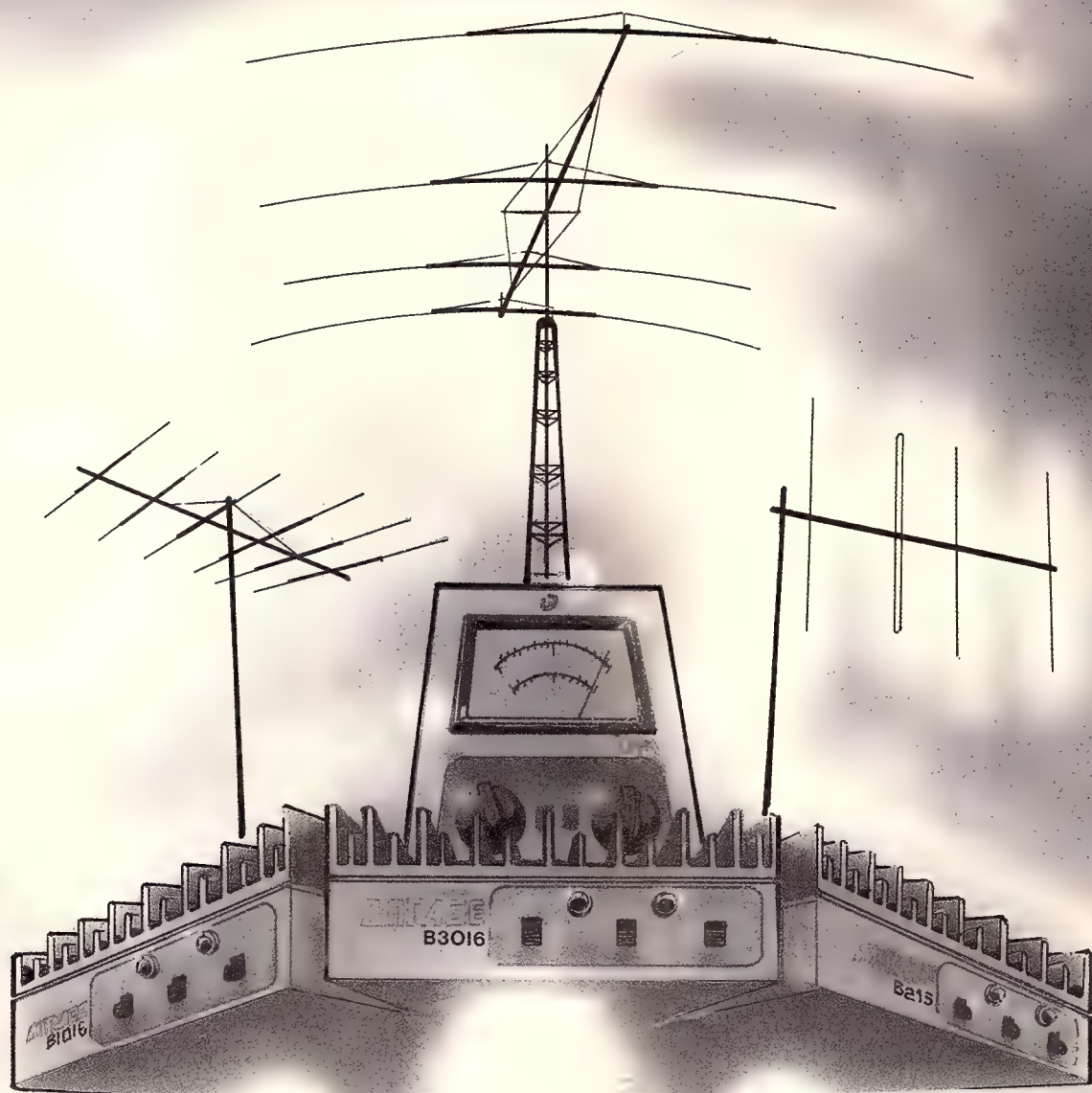
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CIRCLE 135 ON READER SERVICE CARD



# CQ REVIEWS:

## The AEA ATU-1000 Advanced Terminal Unit

BY NORM STERNBERG\*, W2JUP

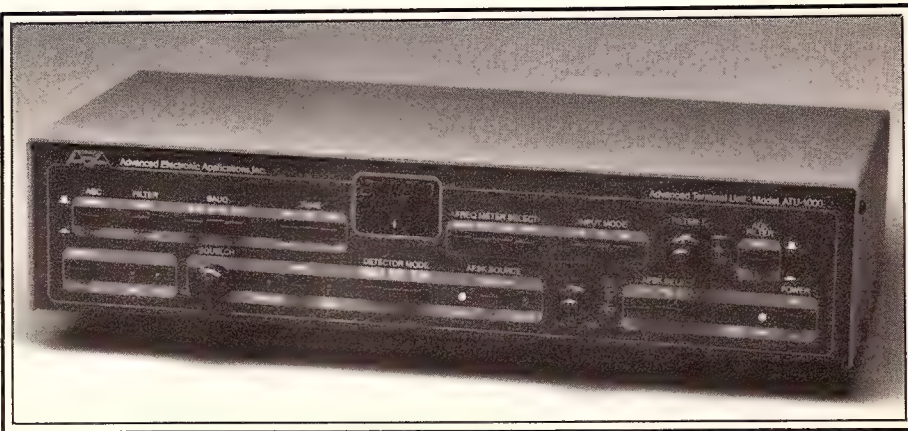
**T**he "bottom line" of this review is simple: If you want to demodulate Baudot and ASCII RTTY, AMTOR, and packet radio at speeds up to 300 bauds and you can't do it with the ATU-1000, you won't do it with anything.

The ATU-1000 is a modulator-demodulator designed for point-to-point HF and VHF radio service in common-carrier communications centers and amateur radio stations. Based on months of tough tests, in my opinion the ATU-1000 compares very favorably with, and in fact outperforms, a number of very expensive commercial TUs. During the RTTY tests the ATU-1000 was critically compared with my Dovetron MPC-1000RC and a Philips SBY-750 shipboard SITOR (AMTOR) unit. The ATU-1000 unquestionably surpassed those commercial systems in its ability to decode the most difficult signal situations with noticeably lower error rates.

I've used the ATU-1000 successfully with a wide range of computers and data terminals, including TTL connections to Commodore's VIC-20, C-64, and C-128; RS232 connections to Apple II+ and IIE, Drake-Tono Theta 9000E, Radio Shack TRS-80 Model III, Tandy 1000HD, SAGE II, IBM Displaywriter, ADDS Viewpoint 60+, Televideo 925, and DEC VT-100. The availability of both TTL and RS232C ports makes the marriage of the ATU-1000 with computers and terminals a piece of cake.

The AEA ATU-1000 is the latest generation in AEA's family of computer interfaces or radio modems—terminal units for Baudot and ASCII RTTY, AMTOR, SITOR and HF packet radio modulation and demodulation.

These applications include TU functions for Morse code; Baudot, ASCII, and AMTOR/SITOR radioteleprinter (RTTY) operation; CW keying and transmitter PTT ("push-to-talk") control; connection between a communications receiver or



Front view of the AEA ATU-1000. All controls are clearly marked as to function.

transceiver and a computer (or electro-mechanical teleprinter).

Using advanced active filter design techniques, the ATU-1000 provides a bunch of very slick operating features, while retaining the reliability, flexibility, and economy that have made AEA a major player in the amateur communications market.

Although the ATU-1000 is probably the most complete radio modem I've ever used in the amateur service, it is a "dumb" box—the ATU-1000 does not have built-in software or firmware "intelligence." The associated computer must provide the appropriate computer communications software regardless of the mode to be used.

The ATU-1000 adjusts, filters, and demodulates incoming AFSK tones from your receiver, converting those tones to the digital (DC) pulses required by your teleprinter or computer I/O port. In the outbound or transmit direction, the ATU-1000 changes the teleprinter or computer's digital pulses into frequency-shifted audio tones or DC-shifted FSK signals, and controls your transmitter's PTT line. Like any other "RTTY Interface," the ATU-1000 permits the transmission and reception of asynchronous and synchronous data over suitable HF and VHF radio circuits using

frequency-shift-keyed modulation techniques.

The ATU-1000 provides both AFSK and FSK radioteleprinter operation, enhanced CW keying, PTT control, and all the mechanical and electrical facilities needed to connect a communications receiver or transceiver with a computer, a mechanical teleprinter, or a standard communications terminal.

AEA designed the ATU's demodulation scheme around a type of heterodyne operation that I've only seen previously in very expensive commercial RTTY systems. The really special feature of the ATU-1000 demodulator is a pair of identical 0.5 dB eight-pole Chebyshev filters. Twin oscillator-modulators mix the input tones to the filter center frequencies.

You can select either fixed or variable frequency shift for both the receive mark and space filters and the AFSK tone generator. The fixed-shift mode is set to the widely accepted almost-standard 170 Hz using 2125 Hz mark and 2295 Hz space tones. However, these fixed-shift tone pairs can be internally reset to any tone pair between 1000 and 3000 Hz.

### Lights, Bells, and Whistles

The ATU-1000 has enough lights, bells, and whistles to gladden the heart of the most demanding enthusiast. And all

\*279 Adirondack Dr., Farmingdale, NY 11738



of them add to the unit's fine performance.

All routine operating controls are located on the unit's front panel and are clearly marked as to function and position.

In addition to fixed-tuned 170 Hz frequency shift mode, the ATU-1000 has variable filter tuning. You can set the receiving demodulator mark and space filters and AFSK generator tones individually with separately adjustable front-panel mounted, ten-turn coaxial trim potentiometers. The ATU-1000's tuning ranges cover all possible combinations of commercial and amateur mark-space (start-stop) tone pairs and audio-frequency shifts, including Bell 103, Bell 202, and CCITT Recommendation V.21 modem tones.

In all forms of RTTY service, mark and space receive filter center frequencies are continuously adjustable from approximately 850 to 3000 Hz. In CW service the space filter is adjustable from approximately 650 to 2400 Hz. No matter if your receiver's CW filter puts the output tone peak somewhere other than the generally accepted 800 to 900 Hz area; the ATU-1000 can be set to accommodate that tone.

The ATU-1000 demodulates conventional mark-space comparison. However, under really bad QRM conditions, you can select either mark-only or space-only detection during interference to either the mark or space data channels.

When operating with fixed tone pairs, a front-panel switch permits you to insert an optional eight-pole bandpass pre-filter. The normal channel bandwidth can be reduced to 180 Hz or 100 Hz for worst-case conditions.

This exceptional front-end filter system is followed by twin full-wave detectors and more filtering—twin four-pole low-pass filters whose selectable cut-off frequencies optimize the system for data rates of 50, 110, and 300 bauds. The output of the filters drives a DC-coupled threshold correction system that provides excellent performance during selective fading and low-signal conditions. All told, the ATU-1000 contains 32 poles of filters.

Received-signal tuning is monitored on a discriminator-style LED bar-graph display, with selectable mark-only, space-only, and summed mark and space indications. Tuning-rate selection permits quick initial tuning and more precise final signal tuning.

A front-panel-mounted four-digit frequency counter with selectable input permits rapid and accurate on-the-air measurement and adjustment of:

- receive mark filter center frequency;
- receive space filter center frequency;
- AFSK generator mark or space frequency;
- received audio signal frequency.

An audio AGC input system with front-panel-selectable fast or slow time con-

stants provides optimum operation with input signal levels from 5 millivolts to 5 volts RMS.

A front-panel squelch control and squelch LED permit fine adjustment of the ATU-1000's system relative to the input signal level for garble-free operation. This is especially useful with electro-mechanical machines. The squelch control can inhibit printing on received background noise, and enable system printout or display when adequate signals are received, and can be easily defeated for getting whatever you can from very weak signals.

A low-distortion sine-wave generator provides phase-coherent AFSK tone signals. As in the case of the receive input mark and space filters, the AFSK generator's mark and space tones may be adjusted over a range of approximately 800 to 3000 Hz. A rear-panel control permits adjustment of AFSK output levels from 0 to approximately 20 millivolts RMS.

A front-panel switch provides selection of either variable-frequency or fixed-frequency AFSK tone generation. The fixed shift is set at the factory to 2125 Hz mark and 2295 Hz space. However, these tones can be internally reset to any tone pair in the range 1000 to 3000 Hz. In

conjunction with the front-panel frequency counter, the AFSK generator's mark and space tones can be set to within 1 Hz.

## Connectors and Connections

All connections between the ATU-1000 and the associated radio, power supply, and computer equipment are made via standard connectors and receptacles located on the unit's rear panel.

Received audio is connected through one of two paralleled 3.5 mm phone jacks. The second jack may be connected to a monitor speaker, oscilloscope, VU meter, or other external devices. An optional 600 ohm balanced input transformer is available.

Computer input/output lines are connected at TTL levels via a five-pin Molex-type rear-panel connector compatible with all AEA data communications hardware. A standard DB-25 connector is available for RS-232-C interface to your computer or communications terminal.

The ATU-1000 can also drive the older electromechanical teleprinters with selector magnet windings operating in high-voltage 20 or 60 ma current loops. A five-pin Molex-type receptacle provides connection to external loop power supplies

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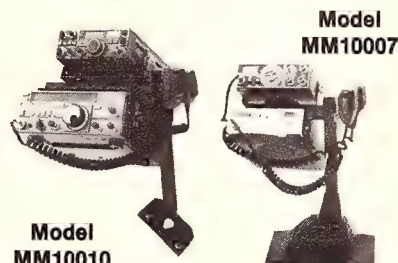
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## Dimensions

Table-top	
Width:	16 inches (406.4 mm)
Height:	3½ inches (88.9 mm)
Depth:	7¼ inches (184.2 mm)
Rack Mount	
Width:	19 inches (482.6 mm)
Height:	3½ inches (88.9 mm)
Depth:	7¼ inches (184.2 mm)
Weight:	10 pounds (4.5 kg)

## Environment

Temperature	
Storage:	- 40 to 85 degrees C
Operation:	0 to 50 degrees C
Humidity:	Up to 95% , non-condensing

## Controls and Indicators

Rear-Panel Controls:	AFSK Output Level Adjust
Front-Panel Controls:	AGC Fast/Slow Select
	Main Filter Wide/Narrow Select
	Baud-Rate 45-50, 75-110, 300 bauds
	Tuning Mark On/Off Select
	Tuning Space On/Off Select
	Tuning Fine/Coarse Select
	Freq. Meter Mark Filter On/Off Select
	Freq. Meter Space Filter On/Off Select
	Freq. Meter AFSK On/Off Select

## Front-Panel Indicators:

Freq. Meter Input On/Off Select
Mark-tone Filter Tuning
Space-tone Filter Tuning
Auxiliary Filter In/Out Select
PTT/Standby/Manual Select
Squelch Adjust
Normal/Reverse Select
Detector Mark & Space On/Off Select
Detector Mark Only Select
Detector Space Only Select
AFSK Computer/Current Loop Select
AFSK Mark-tone Tuning
AFSK Space-tone Tuning
AFSK 170-Shift On/Off Select
AFSK Variable-Tuning On/Off Select
AFSK Space-hold On/Off Select
Power On/Off Select
Frequency Counter, 4-digit LED display
Tuning Indicator, 10-bar LED display
Transmit LED
CW LED
Squelch LED
Anti-Space LED
Receive Mark LED
Receive Space LED
Transmit Space Hold LED
Power LED

Table I—Mechanical specifications of the ATU-1000.

and the associated teleprinters. Isolated high-voltage current loop connections and current-loop output keying circuits are protected by individual 100 ma fuses in both the positive and negative lines.

For critical tuning applications, an external oscilloscope can be connected at rear-panel connections to a pair of isolated outputs from the mark and space filters.

RCA-type phono jacks are used for AFSK tone output and transmitter PTT connections. The PTT control line is switched by an isolated relay contact.

Direct FSK transmitter keying is provided with either normal and reverse FSK for open-collector output drivers. Positive and negative CW keying output voltages are coupled through RCA-type pho-

no jacks. A conventional Morse key can be connected via a ¼ inch phone jack.

## Matters Mechanical

The ATU-1000 occupies 3.5 inches of vertical space in a standard 19 inch rack. AEA can supply optional end plates for rack-mounting on request. The unit can be operated normally as a desk-top system co-located with the associated radio transmitting and receiving equipment. For the mechanical specifications of the ATU-1000, see Table I.

## Matters Electrical

The ATU-1000 requires an external power source capable of supplying well-regulated, well-filtered 12 to 16 volts DC.

Any external power supply meeting this requirement may be used. The ATU-1000's internal fuse in series with the applied DC voltage protects both the power supply and the TU. Power from the external supply is connected by means of a standard coaxial power connector, 5.5 mm outside diameter, 2.1 mm inside diameter. Radio Shack part number 274-1569 is typical. For further electrical specifications, see Table II.

The AEA ATU-1000 has an amateur net of \$1195. There are two options available: 19 inch rack-mounting hardware kit for \$29.95, and a prefilter for specific space, mark, tones, and baud rate which sells for \$129.95. The ATU-1000 is manufactured by AEA, P.O. Box C-2160, Lynnwood, WA 98036-0918.

CQ

## Electrical

Power Requirement:	12-16 volts DC at approx. 350 ma
Input Impedance:	10K ohms minimum, unbalanced 600 ohms balanced (optional)
Input Signal Level:	AGC controlled, .005-5 volts RMS
Maximum Bit Rates	
Receive Signal:	300 bauds
Transmit Signal:	300 bauds
Receive Filter Tuning	
Mark Filter:	Approximately 850 to 3000 Hz
Space Filter:	Approximately 850 to 3000 Hz
Transmit AFSK Generator:	Phase continuous, sine-wave AFSK
Output Level:	Adjustable, 0-.075 volts RMS
Mark Tone:	Approximately 850-3000 Hz
Space Tone:	Approximately 850-3000 Hz
CW Receive Filter Tuning:	Approximately 650-2400 Hz

## Connectors and Receptacles

Front Panel:	None
Rear Panel	
Input Circuits:	Audio input, two paralleled jacks Morse Key

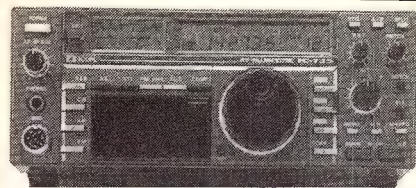
## Output Circuits:

Power Input, 13 volts DC
Transmitter push-to-talk (PTT)
High-voltage current loop input
Demodulator output, TTL
AFSK Output
CW Keyer, negative and positive
High-voltage current loop keyer
FSK output, negative and positive
Transmitter PTT
Oscilloscope output, mark tone
Oscilloscope output, space tone
In accordance with EIA RS-232-C, CCITT Recommendations V.24 and V.28
Receive Data (RD)
Transmit Data (TD)
Ready to Send (RTS)
Clear to Send (CTS)
Data Set Ready (DSR)
Ring Indicate (RI)

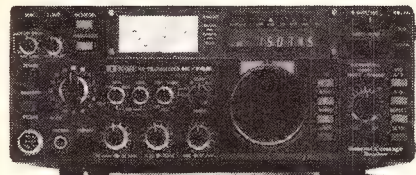
Note: The ATU-1000 is normally supplied without cables. Cables are included in the AEA software packages supplied for specific computers.

Table II—Electrical specifications of the ATU-1000.

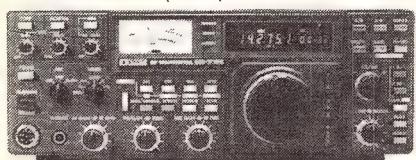




HF Equipment	
IC-735 HF transceiver/SW rcvr/mic	999.00 849 <sup>95</sup>
PS-55 External power supply	199.00 179 <sup>95</sup>
AT-150 Automatic antenna tuner	445.00 359 <sup>95</sup>
FL-32 500 Hz CW filter	66.50
EX-243 Electronic keyer unit	56.00
UT-30 Tone encoder	17.50



IC-745 9-band xcvr w/1-30 MHz rcvr	1049.00 899 <sup>95</sup>
PS-35 Internal power supply	199.00 179 <sup>95</sup>
EX-241 Marker unit	22.50
EX-242 FM unit	44.00
EX-243 Electronic keyer unit	56.00
FL-45 500 Hz CW filter (1st IF)	66.50
FL-54 270 Hz CW filter (1st IF)	53.00
FL-52A 500 Hz CW filter (2nd IF)	108.00 99 <sup>95</sup>
FL-53A 250 Hz CW filter (2nd IF)	108.00 99 <sup>95</sup>
FL-44A SSB filter (2nd IF)	178.00 159 <sup>95</sup>



IC-751 9-band xcvr/1-30 MHz rcvr	1399.00 999 <sup>00</sup>
IC-751A 9-band xcvr/1-30 MHz rcvr	1649.00 1399
PS-35 Internal power supply	199.00 179 <sup>95</sup>
FL-32 500 Hz CW filter (1st IF)	66.50
FL-63 250 Hz CW filter (1st IF)	54.50
FL-52A 500 Hz CW filter (2nd IF)	108.00 99 <sup>95</sup>
FL-53A 250 Hz CW filter (2nd IF)	108.00 99 <sup>95</sup>
FL-33 AM filter	35.25
FL-70 2.8 kHz wide SSB filter	52.00
RC-10 External frequency controller	39.25

Other Accessories:	
IC-2KL 160-15m solid state amp w/ps	1999.00 1699
PS-15 20A external power supply	169.00 154 <sup>95</sup>
PS-30 Systems p/s w/cord, 6-pin plug	299.00 269 <sup>95</sup>
OPC Opt. cord, specify 2, 4 or 6-pin	10.00
MB Mobile mount, 735/745/751A	24.50
SP-3 External speaker	61.00
SP-7 Small external speaker	49.00
CR-64 High stab. ref. xtal (745/751)	63.00
PP-1 Speaker/patch	159.25 149 <sup>95</sup>
SM-6 Desk microphone	44.95
SM-8 Desk mic - two cables, Scan	78.50
SM-10 Compressor/graph EQ, 8 pin mic	136.25 124 <sup>95</sup>
AT-100 100W 8-band auto. antenna tuner	445.00 389 <sup>95</sup>
AT-500 500W 9-band auto. antenna tuner	559.00 489 <sup>95</sup>
OPC-118 Adapts AT-100/500 to IC-735	16.00
AH-2 8-band tuner w/mount & whip	625.00 549 <sup>95</sup>
AH-2A Antenna tuner system, only	495.00 429 <sup>95</sup>
OPC-137 Adapts AH-2/2A to IC-751/745	16.00



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Other Accessories - continued:	
GC-4 World Clock (Closeout)	99.95 59 <sup>95</sup>
GC-5 World clock	91.95
6-meter VHF Portable	
IC-505 3/10W 6m SSB/CW portable	549.00 489 <sup>95</sup>
BP-10 Internal Nicad battery pack	89.00
BP-15 AC charger	14.00
EX-248 FM unit	55.50
LC-10 Leather case	39.50

VHF/UHF base multi-modes	
IC-551D 80W 6-meter SSB/CW	799.00 699 <sup>95</sup>
EX-106 FM option	140.00 126 <sup>95</sup>
BC-10A Memory back-up	9.50
IC-271A 25W 2m FM/SSB/CW	859.00 759 <sup>95</sup>
AG-20 Internal preamplifier	64.00
IC-271H 100W 2m FM/SSB/CW	1099.00 969 <sup>95</sup>
AG-25 Mast mounted preamplifier	95.00
IC-471A 25W 430-450 SSB/CW/FM xcvr	979.00 869 <sup>95</sup>
AG-1 Mast mounted preamplifier	99.50
IC-471H 75W 430-450 SSB/CW/FM	1399.00 1169
AG-35 Mast mounted preamplifier	95.00

Accessories common to 271A/H and 471A/H	
PS-25 Internal power supply for (A)	115.00 104 <sup>95</sup>
PS-35 Internal power supply for (H)	199.00 179 <sup>95</sup>
SM-6 Desk microphone	44.95
EX-310 Voice synthesizer	46.00
TS-32 CommSpec encode/decoder	59.95
UT-15 Encoder/decoder interface	14.00
UT-15S w/TS-32 installed	92.00

VHF/UHF mobile multi-modes	
IC-290H 25W 2m SSB/FM, TTP mic	639.00 569 <sup>95</sup>
IC-490A 10W 430-440 SSB/FM/CW	699.00 599 <sup>95</sup>

VHF/UHF/1.2 GHz FM	
IC-27A Compact 25W 2m FM w/TTP mic	429.00 379 <sup>95</sup>
IC-27H Compact 45W 2m FM w/TTP mic	459.00 399 <sup>95</sup>
IC-37A Compact 25W 220 FM, TTP mic	499.00 439 <sup>95</sup>
IC-47A Compact 25W 440 FM, TTP mic	549.00 489 <sup>95</sup>
PS-45 Compact 8A power supply	139.00 129 <sup>95</sup>
UT-16/EX-388 Voice synthesizer	34.99
SP-10 Slim-line external speaker	35.99

IC-28A 25W 2m FM, UP/DN mic	429.00 379 <sup>95</sup>
IC-28H 45W 2m FM, UP/DN mic	459.00 399 <sup>95</sup>
IC-48A 25W 440-450 FM	459.00 399 <sup>95</sup>
HM-14 TTP microphone	55.50
UT-28 Digital code squelch	37.50
UT-29 Tone squelch decoder	43.00
HM-16 Speaker/microphone	34.00
IC-3200A 25W 2m/440 FM w/TTP	599.00 499 <sup>95</sup>
UT-23 Voice synthesizer	34.99

AH-32 2m/440 Dual Band antenna	37.00
AHB-32 Trunk-lip mount	34.00
Larsen PO-K Roof mount	20.00
Larsen PO-TLM Trunk-lip mount	20.18
Larsen PO-MM Magnetic mount	19.63
RP-3010 440 MHz, 10W FM, xtal cont.	1229.00 1099
IC-120 1W 1.2 GHz FM Mobile	579.00 499 <sup>95</sup>
ML-12 1.2 GHz 10W amplifier	379.00 339 <sup>95</sup>
IC-1271A 10W 1.2 GHz SSB/CW Base	1229.00 1079
AG-1200 Mast mounted preamplifier	105.00
PS-25 Internal power supply	115.00 104 <sup>95</sup>
EX-310 Voice synthesizer	46.00
TV-1200 ATV interface unit	129.00 119 <sup>95</sup>
UT-15S CTCSS encoder/decoder	92.00
RP-1210 1.2 GHz, 10W FM, 99 ch. synth	1479.00 1299



### Hand-held Transceivers

Deluxe models	Regular	SALE
IC-02AT for 2m	399.00	339 <sup>95</sup>
IC-04AT for 440 MHz	449.00	389 <sup>95</sup>
Standard models		
	Regular	SALE
IC-2A for 2m	279.00	249 <sup>95</sup>
IC-2AT with TTP	299.00	259 <sup>95</sup>
IC-3AT 220 MHz, TTP	339.00	299 <sup>95</sup>
IC-4AT 440 MHz, TTP	339.00	299 <sup>95</sup>

IC-12AT 1W 1.2GHz FM HT/batt/cgr/TTP	459.00 399 <sup>95</sup>
A-2 5W PEP synth. aircraft HT	569.00

Accessories for Deluxe models	
	Regular
BP-7 425mah/13.2V Nicad Pak - use BC-35	74.25
BP-8 800mah/8.4V Nicad Pak - use BC-35	74.25
BC-35 Drop in desk charger for all batteries	74.95
BC-16U Wall charger for BP7/BP8	20.25
LC-11 Vinyl case for Dlx using BP-3	20.50
LC-14 Vinyl case for Dlx using BP-7/8	20.50
LC-02AT Leather case for Dlx models w/BP-7/8	54.50

Accessories for both models	
	Regular
BP-2 425mah/7.2V Nicad Pak - use BC35	47.00
BP-3 Extra Std. 250 mah/8.4V Nicad Pak	37.50
BP-4 Alkaline battery case	15.25
BP-5 425mah/10.8V Nicad Pak - use BC35	58.50
CA-5 5/8-wave telescoping 2m antenna	18.00
FA-2 Extra 2m flexible antenna	11.50
CP-1 Cig. lighter plug/cord for BP3 or Dlx	13.00
CP-10 Battery separation cable w/clip	22.50
DC-1 DC operation pak for standard models	23.25
EX-390 Bottom slide cap.	5.50

MB-16D Mobile mtg. bkt for all HTs	21.99
LC-2AT Leather case for standard models	54.50
RB-1 Vinyl waterproof radio bag	31.50
HH-SS Handheld shoulder strap	16.95
HM-9 Speaker microphone	47.00
HS-10 Boom microphone/headset	23.25
HS-10SA Vox unit for HS-10 & Deluxe only	23.25
HS-10SB PTT unit for HS-10	23.25
ML-1 2m 2.3w in/10w out amplifier	SALE 99.95
SS-32M CommSpec 32-tone encoder	29.95

Receivers		Regular	SALE
R-71A	100 kHz-30 MHz, 117V AC.....	\$949.00	799 <sup>95</sup>
RC-11	Infrared remote controller ...	67.25	
FL-32	500 Hz CW filter .....	66.50	
FL-63	250 Hz CW filter (1st IF) .....	54.50	
FL-44A	SSB filter (2nd IF) .....	178.00	159 <sup>95</sup>
EX-257	FM unit .....	42.50	
EX-310	Voice synthesizer.....	46.00	
CR-64	High stability oscillator xtal	63.00	
SP-3	External speaker .....	61.00	
CK-70 (EX-299)	12V DC option .....	12.25	
MB-12	Mobile mount.....	24.50	
R-7000	25 MHz-2 GHz scanning rcvr	1099.00	969 <sup>95</sup>
RC-12	Infrared remote controller ...	67.25	
EX-310	Voice synthesizer.....	46.00	
AH-7000	Radiating antenna .....	89.95	(9)

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**Taking off from his November 1985 article, W5PRG takes us through High-Q Packet Digipeating via an existing repeater.**

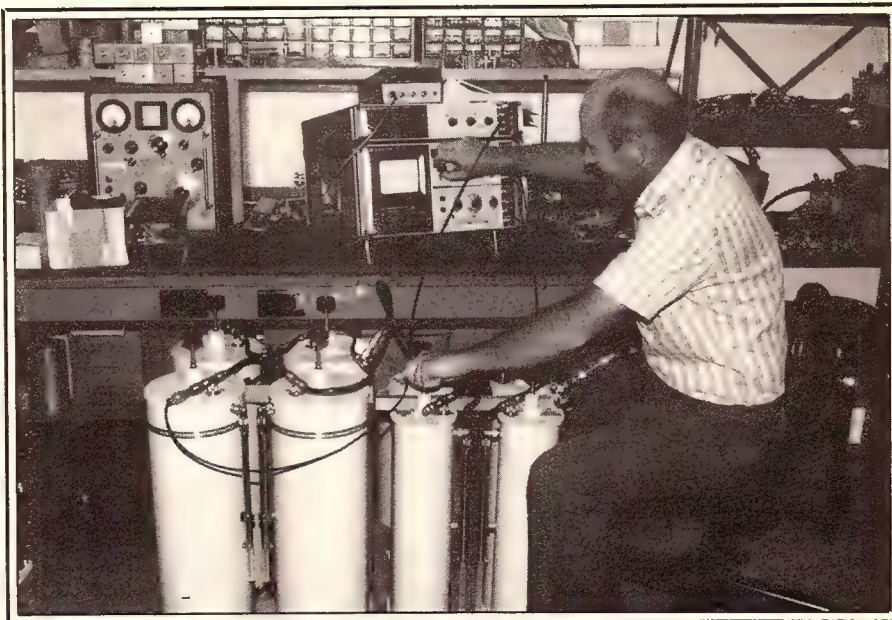
# BRIEFLY SPEAKING— HIGH-Q DIGIPEATING

BY W. MAX ADAMS\*, W5PFG

**A**n amateur packet-radio digital repeater is born when the operator sets his Terminal Node Controller (TNC) "digipeat" command **ON**. Using this feature, area packet-hams (PAKHAMS) can extend their station's simplex operating range to include the real estate covered by the digipeating station(s). A dumb terminal can be disconnected from the TNC. The transceiver, antenna feedline, and antenna can then be left atop a nice high tower, on a nice high hill or mountaintop, as a wide-area digipeater.

The Anderson County Amateur Radio Club's Elmwood voice repeater in Palestine, Texas, provides mobile coverage to more than five Texas counties. Since 600 feet of  $\frac{3}{8}$  inch hardline and a DB-224 antenna was talking this well, why not use it to also load the TNC-controlled packet-radio transceiver? This would, however, require some isolation between the digipeater and the voice machine.

Fortunately, WACOM Products, Inc. (Waco, Texas) was just 115 short Texas miles west of Palestine, Texas by road and only a few inches away by telephone. Ray Lively, KB5OQ, custodian of the ACARC's two voice machines, contacted Kit Parsons and Lloyd Alcorn at WACOM. WACOM's High-Q cavities are well known for isolating a transmitter from a receiver even when connected to the same antenna. For example, using a WACOM Model WD-641 duplexer places a 600 kHz spaced transmitter — 90 dB away from its companion receiver, yet is almost a short circuit (— 1.5 dB) path from the transmitter to the antenna. Ray placed an order for a four-cavity WACOM "combiner."



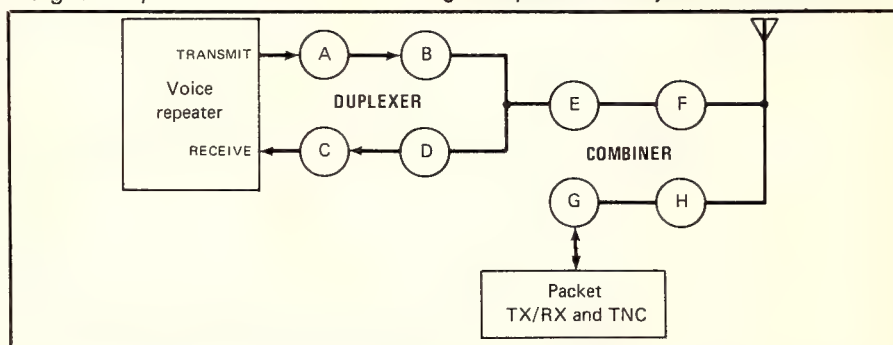
Lloyd Alcorn of WACOM is shown putting the finishing touches on a duplexer.

On the way down to Palestine I went by the WACOM factory at Waco. When I arrived, Kit and Lloyd came up with three cups of coffee and a "few" amateur packet-radio questions. It is hard to cover digital communications all the way to the

antenna in just one cup of coffee, so a "fresh pot" was made. Lloyd ended the drink/talking session sitting in the QC-lab twisting knobs on a Hewlett-Packard HP-8554B spectrum analyzer.

A diagram of the circuit under test is

Fig. 1— Duplexer/combiner circuit using bandpass/band-reject resonant cavities.



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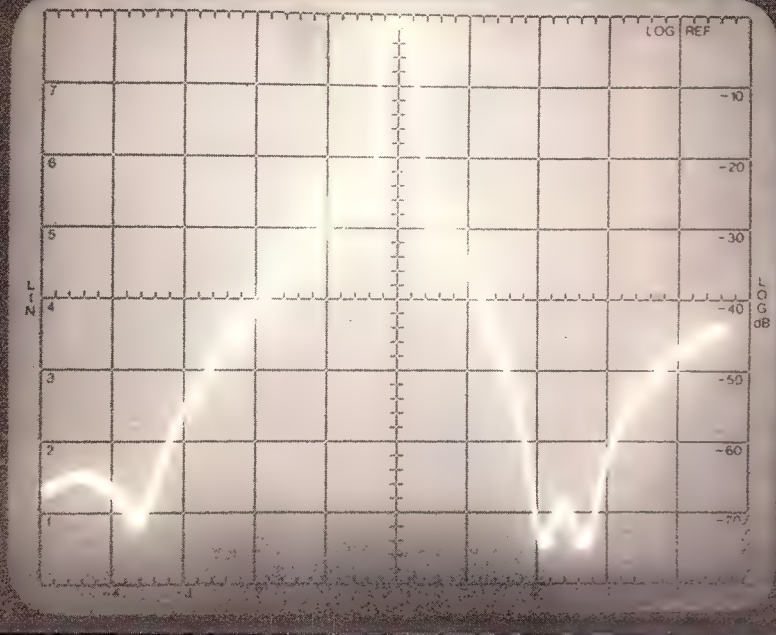


Fig. 2—The 145.01 MHz packet port response. From top to bottom the squares are 10 dB per division, and from right to left, 1 MHz per division. The same holds true for figs. 3 and 4. In this shot the voice repeater receiver is at 147.08 MHz, and the voice transmitter port is at 147.68 MHz. Both are -80 dB down.

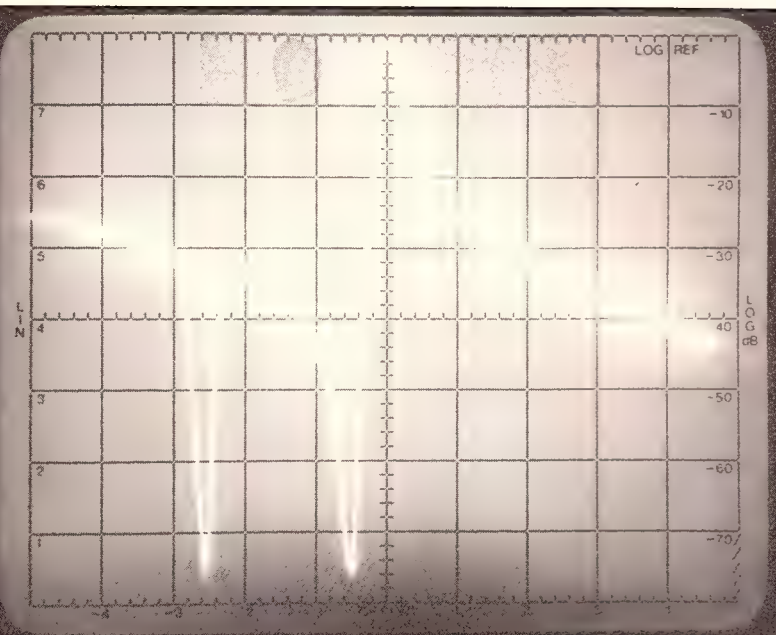


Fig. 3—The receiver port passband response, and rejection notches at the other frequencies.

shown in fig. 1. Duplexer cavities A, B, C, and D provide bandpass/band rejection for the voice repeater's transmitter/receiver signals. Combiner cavities E and F pass the voice repeater signals and reject the digipeater signals. Combiner cavities G and H pass the digipeater signals and reject the voice transmitter/receiver signals. When both systems are operating, the signals are "combined" and fed to and from the antenna using only one antenna feedline.

Lloyd provided me with scope photo-

graphs showing the signal response at each of the system's three ports. The 145.01 MHz packet port response, shown in fig. 2, is referenced to 0 dB. The voice repeater receiver (147.08 MHz) and voice transmitter (147.68 MHz) ports are the -80 dB notches "up-the-band." Figs. 3 and 4 show the receiver and transmitter passband response, and the rejection notches at the other frequencies.

Tuning of the cavities is very critical and should not be attempted without proper equipment. An experienced "cavity



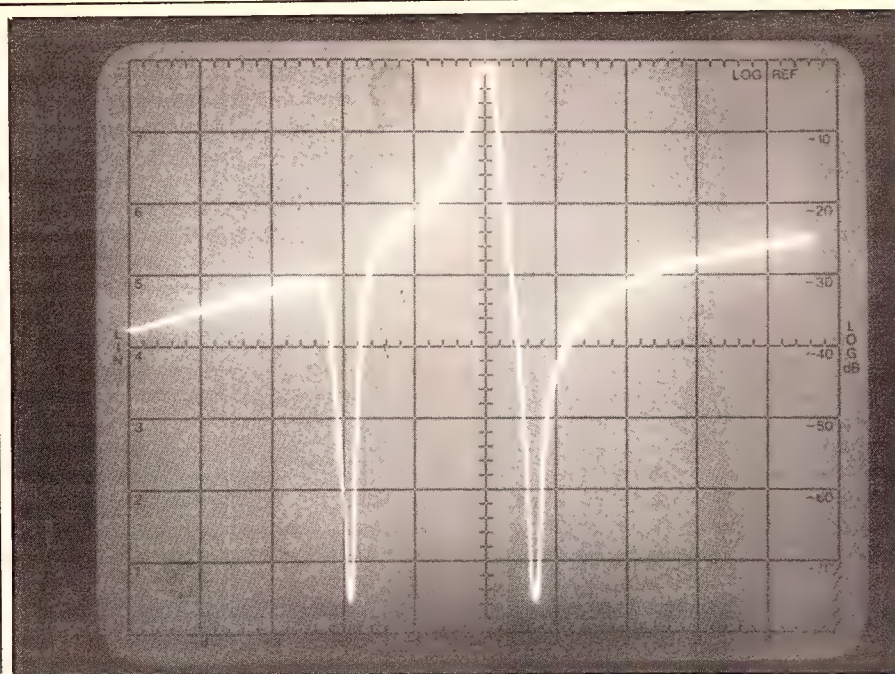


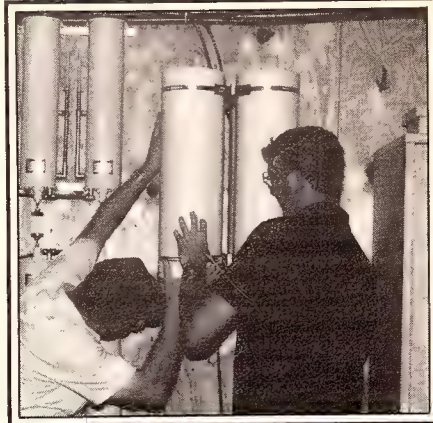
Fig. 4—The transmitter passband response and rejection notches.

tuner" may be fortunate enough to "tweak" a system. However, Mr. Murphy usually wins when proper equipment is not used.

Ray, KB5OQ, using Hill-Tex Communications Motorola Model 2200A and IFR FM/AM-500 monitors, carefully measured the installed system's signal characteristics. No cavity tuning was necessary to attain factory specifications. The voice repeater desensing by the packet transmitter was less than 1 dB, and the packet desensing by the voice transmitter was below measurement limits! Table

I lists the equipment used in the voice/digipeater installation. On-the-air signal reports and packet connections quickly verified that the system was a "hummer"!

The first packet contact was with Pat, NB5I, who had been in constant voice contact all day using a Kenwood TH-21A "talkie" with a "stubby-duck" 13 miles down the 700 foot hill in Palestine! Several "first-try" connections were made with Silicon Metroplex (Dallas, Texas) PAK-HAMS using the Southwest Dallas County ARC (KC5LW-1) digipeater in Cedar Hill, Texas.



Dale, WD5JRF, and Ray, KB5OQ, are shown hooking up everything back at the repeater site.

**Antenna:** DB-224 fed with 600 feet  $\frac{7}{8}$  hardline (net antenna system gain, 4.2 dB, omnidirectional).

**Voice Transmitter/Receiver:** Motorola MO-TRAN (Modified). Transmitter 25 watts, receiver — 0.6 uv (20 dB quieting through duplexer).

**Packet Transceiver:** Geneve GMT-125 (crystal controlled). Transmitter 20 watts, receiver — 0.5 uv (20 dB quieting through combiner).

**Voice Duplexer:** WACOM Model WP-641 (4 cavities).

**Packet Combiner:** WACOM Model WP-535 (2 each), and WACOM Model WP-235 (2 each).

Table I—ACARC KB5OQ-1 voice/digipeater equipment.

The Plano (Texas) Amateur Radio Klub (PARK) (no, it's not a typo) was operating from their amateur-radio/fire-prevention booth at Plano's Collin Street Mall. Using K5VOU's AEA TNC/ICOM 22S packet station; PARK members were contacted several times. Another digipeat was necessary to "get the signal outside the mall"! For those of you without a Texas map, Cedar Hill is about 92 miles north-east of the Elmwood (KB5OQ-1) digipeater and about 35 miles south of Plano!

The economics of a combiner is quickly understood when you consider the cost of 600 feet of  $\frac{7}{8}$  inch hardline and an antenna suitable for years of service atop a 560 foot tower (plus "some" installation and service considerations)!

Another feature is not readily apparent in the accomplishment of this installation. In the event of an emergency, any voice repeater antenna system can be pressed into service simply with the addition of four WACOM cavities, a 2 meter transceiver, and a preprogrammed TNC! *All that is required is to disconnect the antenna from the presently installed duplexer, and then connect the combiner "in series" with the voice machine, power up the packet station, and start handling traffic at 120 words per minute, with 100 percent accuracy!*

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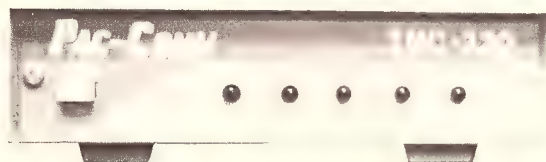
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- Two radio ports
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- 300 and 1200 bauds
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- Multi-color status LED's
- Supports RS-232 and TTL computers
- Active HF bandpass filter
- Tuning indicator option
- 12 volt DC operation
- Premium quality case
- 6" w x 2" h x 7" d

An assembled TNC-220 includes radio and power connectors, complete operator's manual and command reference card. The kit also contains a detailed, step-by-step assembly manual. And, of course, the quality and support you expect from the "Specialists in Packet Radio".

The TNC-220 has the familiar TAPR command set and AX.25 Level 2 Version 2 protocol running on a Z-80 processor with 32k bytes of EPROM and 16k bytes of battery-backed RAM. A Zilog 8530 Serial Communications Controller performs all packet HDLC in hardware. The RS-232 port includes a jumper to select TTL interfacing to your VIC-20, C-64/128 or other TTL computer. Five large, color-coded LED's clearly indicate the TNC-220 status at a glance. The power switch is located on the front panel. TNC-220 is enclosed in a rugged extruded aluminum cabinet. The attractive Pac-Comm two-tone blue front panel has large, clear labels on all indicators and controls.

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### Amateur Net Price Schedule

	Kit	Assembled
DR-100	\$ 84.95	\$ 99.95
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Both digipeaters use a Z-80 processor which has up to 32k bytes of EPROM and two JEDEC sockets for 2/8/16/32k bytes of battery-backed RAM. A Z80-CTC is provided in the DR-200 for dual-port scheduling/interrupts. Packet HDLC operations are handled in hardware by a Zilog 8530 SCC. Both use the AMD 7910 LSI modem chip. Each modem channel has a standard disconnect header and time-out timer. The CPU itself has a hardware watchdog timer and external hard reset line. The circuit board is RFI shielded by our extruded aluminum case. All connections are soldered to feedthroughs.

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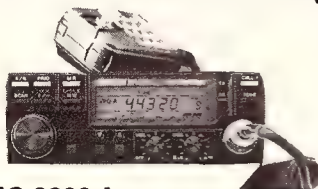
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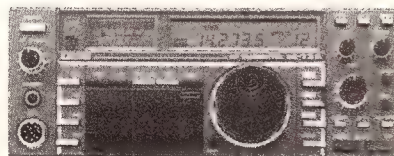
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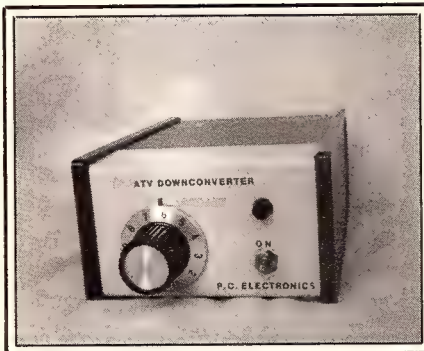
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# CQ SHOWCASE



## P.C. Electronics GaAsFET ATV Downconverter For 33 cm

P.C. Electronics has added a GaAsFET ATV downconverter for the new 33 cm (902-928 MHz) band to their line. Just as is used in their 70 and 23 cm ATV downconverters, a dual gate GaAsFET is used in both the RF preamp and mixer stage for low noise and wide dynamic range. A varicap VCO tunes the whole band down to TV channel 3 (2 or 4 can also be used if channel 3 is used in your area by a strong broadcast station). Total conversion gain is around 25 dB. The model TVC-9G is ready to go in the cabinet shown with a wall-mount 120 VAC to 12 VDC power supply. Just add antenna, coax, and your TV set. Antenna input is a BNC connector, and the TV output is type F. The shielded cabinet is 4" x 2.5" x 7". For those who want to package their own, the TVC-9 is available as a wired and tested board. Size is 2" x 4".

For more information on the TVC-9 (\$69.00) and TVC-9G (\$109.00), or similar ATV downconverters for the 70 and 23 cm amateur bands, contact P.C. Electronics, 2522 Paxson Lane, Arcadia, CA 91006, or circle number 102 on the reader service card.

## Rotating Tower Systems Hardware Systems

Rotating Tower Systems offers complete hardware systems to rotate 45 or 55 towers. Separate systems for 45 and 55 are based on the same design concept, but are tailored for separate mechanical and strength requirements. The hardware is easily assembled with no special equipment, maker says. The rotating base can be mounted at any tower height, minimizing the number of guy-wire bearing sets. All bearings and drive compo-

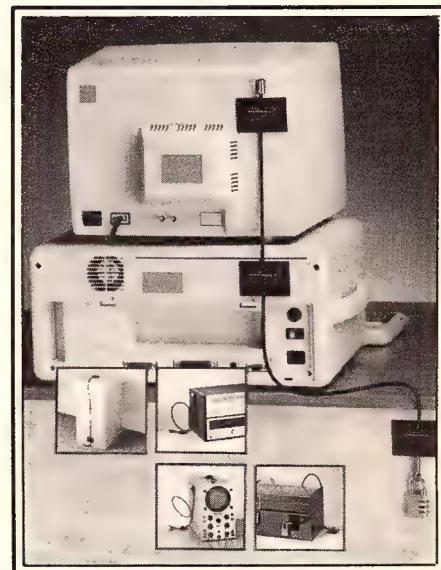
nents are replaceable without tower disassembly. The hardware is fabricated from high-quality steels.

For a description of the hardware and how it is currently being used, see the article "The TH28DX" by R.H. Mitchell, N5RM, in the August 1986 issue of CQ on page 11. For more information on the hardware systems, contact the manufacturer, Rotating Tower Systems, Inc., Box 44, Prosper, TX 75078, or circle number 105 on the reader service card.

## Business Security Systems Technalock

Technalock is a way to secure movable equipment from theft. Pressure-sensitive adhesive bonds a strong securing plate to the equipment. A tough but flexible vinyl-coated steel cable and a lock complete the system. It can be used to secure valuable items in the office, workshop, factory, home, and recreational vehicle. It can secure computers, typewriters, copy machines, tool boxes, electronic equipment, outboard motors, bicycles, etc. Technalock can quickly be installed out-of-sight at the rear of equipment and desks. No tools are needed and it does not void equipment warranties. It takes nearly 400 lbs. to dislodge the plates in most applications.

The master system retails for \$24.95 and expansion kits are available. For more information, contact Business Security Systems, 512 South Hanley, St. Louis, MO 63105, or circle number 103 on the reader service card.



## CTM

The magazine for Computerist & Amateur Radio  
Your #1 source of Packet info.

received my moneys worth with just one issue

—J. Trenbick

always stop to read CTM, even though most other magazines I receive (and write for) only get cursory examination

—Fred Blechman, K6UGT

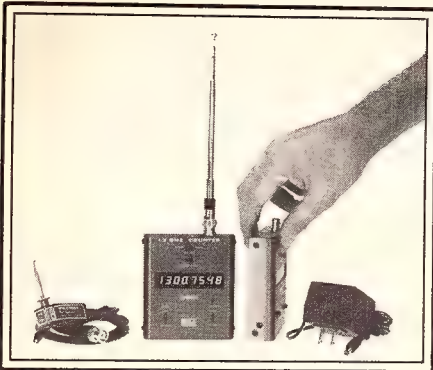
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CIRCLE 96 ON READER SERVICE CARD

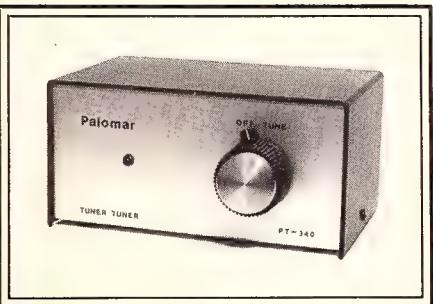




## OPTOelectronics 1.3 GHz Shirt-Pocket Frequency Counter

OPTOelectronics, Inc. has introduced the model 1300H frequency counter. With an anodized aluminum cabinet  $3\frac{1}{2}$ "W x 4"H x 1"D, the unit has self-contained, rechargeable nickel-cadmium batteries, a signal measurement range of 1 MHz to over 1.3 GHz, 8 red .28 inch high LED digits, and a BNC signal input connector. Switches are provided for AC or battery operation, fast or slow gate time, high or normal sensitivity, and range select: 1-500 MHz or 500-1300 MHz. Resolution is to 1 kHz in .25 seconds or 100 Hz in 2.5 seconds over the entire range. Accuracy to  $\pm .00001\%$ ,  $\pm 1$  count LSD is achieved with an RTX0 time base.

The 1300H comes equipped with a 110 VAC/9 VDC adapter for AC operation and charging batteries. Optional accessories include a carrying case, probe, and telescoping antenna. The unit sells for \$150. For more information, contact OPTOelectronics, Inc., 5821 NE 14th Ave., Ft. Lauderdale, FL 33334, or circle number 107 on the reader service card.



## Palomar Engineers Tuner-Tuner™

Palomar Engineers has announced a new operating aid, the Tuner-Tuner™. It connects between the transceiver and antenna tuner. With it you can tune your tuner exactly without transmitting. The built-in 50 ohm noise bridge gives an audible null in the receiver when the tuner matches the coaxial line to 1:1 SWR. The transmitter never need operate into high SWR, and interference need not be caused on the band while tuning up.

The Model PT-340 Tuner-Tuner™ is

\$99.95 plus \$4 shipping. For more information, contact Palomar Engineers, Box 455, Escondido, CA 92025, or circle number 101 on the reader service card.

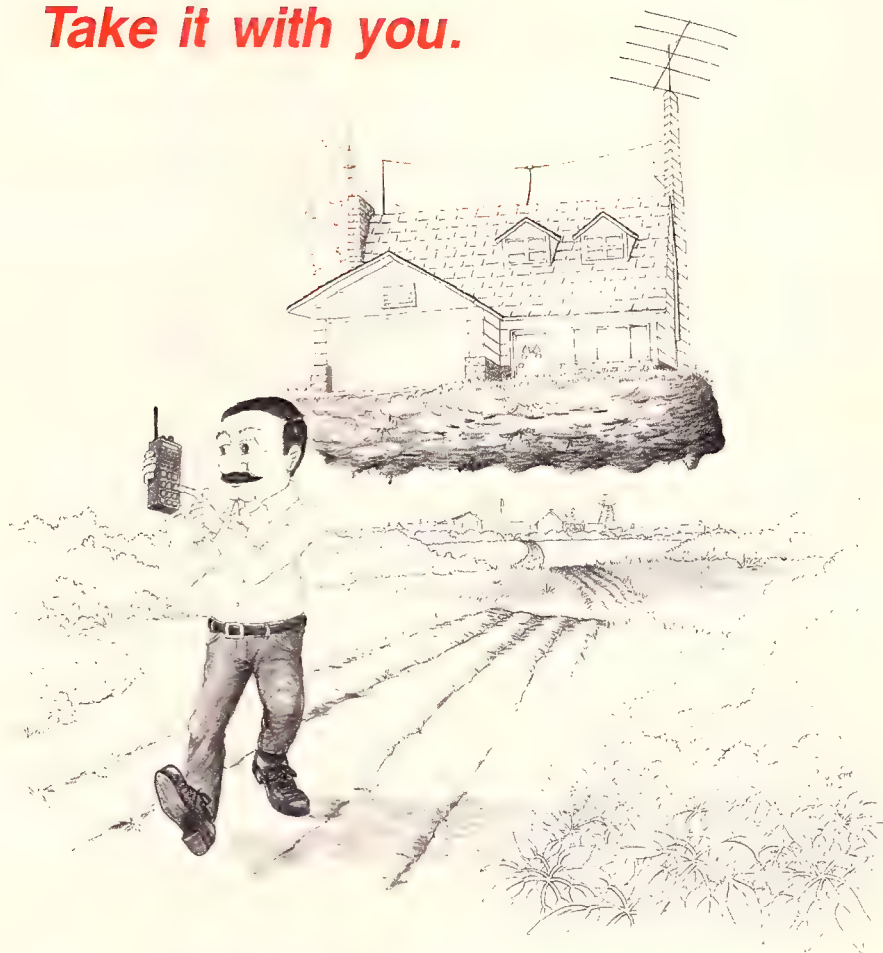
## Sams Handbook of Electronics Tables & Formulas

Howard W. Sams & Co. has announced the sixth edition of *Handbook of Electronics Tables & Formulas*, a reference book for engineers, technicians, hobbyists, and others involved in the field of electronics. This expanded and updated sixth edition reflects the recent developments in the rapidly changing electronics industry. New in the softbound

book's 265 pages are computer programs (written for Commodore 64 with conversion in Apple, Radio Shack, and IBM) for calculating electrical and electronic equations and formulas. New formulas include power units, graphical reactance relations, power triangle, and decibels/voltage power diagrams. New constants include standard potentiometer tapers and the Kansas City standard.

Written by the electronic engineering staff at Howard W. Sams, *Handbook of Electronics Tables and Formulas* retails for \$19.95. For more information, contact Howard W. Sams & Co., 4300 W. 62nd St., Indianapolis, IN 46268, or circle number 106 on the reader service card.

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ShackMaster™ puts your home station in the palm of your hand. Whether portable, mobile, around the yard or around town you'll be linked through your handheld to your high performance equipment at home. Even call home from any Touch-Tone phone and operate.

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- HF/VHF/UHF Base Station
  - Plug-in Modules for 6m, 2m, 440 MHz
  - Loaded with Features
- \$ SPECIAL PRICE \$**

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## CORSAIR II

- You have to hear it to believe it!
- Lowest Noise, Cleanest & Most Selective HF Transceiver Around—AMERICAN MADE

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## Power Meters

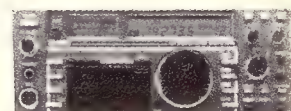
- Large Selection of Meters Always on Hand
- \$ SPECIAL PRICE \$**

**ICOM**



## IC-751A

- All HF Band Transceiver/ Gen. Coverage Receiver
  - All Modes, All Top-of-the-Line
- \$ SPECIAL PRICE \$**



## IC-735

- Most Compact and Advanced Full-Featured HF Transceiver on the Market.
- \$ SPECIAL PRICE \$**

## FT-727R

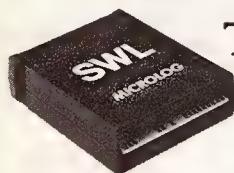
- Dual Band Handie
  - 5 Watts Power on 2m & 440 MHz
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# THE Short Wave Listener FOR RECEPTION OF MORSE CODE & RADIO TELETYPE SIGNALS.

Plug the SWL cartridge into your Commodore "64" Expansion Port, connect a shortwave radio and you'll be watching text readout from weather stations, news services, ships and HAM radio operators all over the world. A whole new use for your home computer. The SWL contains both program in ROM and radio interface circuit to copy Morse code and all speeds/shifts of radio teletype. Plus the on screen tuning indicators mean you never have to take your eyes off the video for perfect tuning. Housed in a small 3" x 2-1/2" x 7/8" enclosure, with speaker in/out and practice hand key jacks, it needs no other computer connection or power supply. Unshift on space, word wrap around, real time clock, and keyword or manual printer control for permanent paper copy, so that you won't miss a single bit of the action. For about the price of another "Pac-Zapper" game, you can tie into the exciting world of digital communication with the Microlog SWL.

**\$64**

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# LEARN MORSE CODE THE RIGHT WAY WITH THE Morse Coach.

**\$4995**



A complete Morse code tutor in a convenient plug-in cartridge for your Commodore "64." The Morse Coach means business. It's not a toy program or a simple random code generator. Originally developed jointly by Microlog and several government agencies experienced in Morse instruction. Four years of extensive service prove it's the quickest way to Morse proficiency. The method works! You start from absolutely no knowledge of Morse, progress through the alphanumeric symbols, and on to any speed desired. The "alphabet" part of the program introduces new characters and plots the progress on a bar-chart. The speed/test section correlates the input, analyzes mistakes and provides a printout of the analysis/test results on your Commodore screen or printer. As a bonus, it also boosts typing skill. You've never seen any tape or program do that! In fact, there's never been a system so thorough, so efficient and so effective as the Microlog Morse Coach.

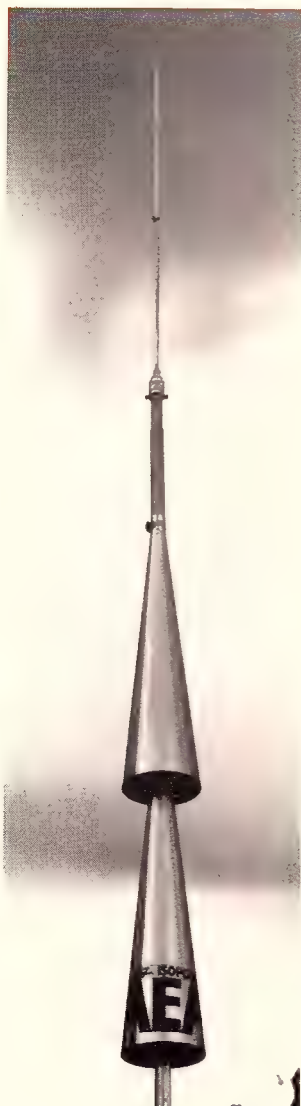
CIRCLE 21 ON READER SERVICE CARD



# Put More Punch in Your Packet

Outstanding mechanical design makes the IsoPole the only logical choice for a VHF base station, especially for Packet operation. All IsoPole antennas yield the **maximum gain attainable** for their respective lengths and a maximum signal on the horizon. Exceptional decoupling from the feed line results in simple tuning and a significant reduction in TVI potential. The IsoPole antennas are all impedance matched in the factory so that no field tuning is required. The IsoPoles have the broadest frequency coverage of any comparable VHF base station antenna. This means no loss of power output from one end of the band to the other, when used with SWR protected solid state transceivers. **Typical SWR is 1.4 to 1 or better across the entire band.**

A standard 50 Ohm SO-239 connector is recessed within the base sleeve (fully weather protected). With the IsoPole you will not experience aggravating deviation in SWR with changes in weather. The impedance matching network is weather sealed and designed for maximum legal power. The aerodynamic cones are the only appreciable wind load and are attached directly to the support (a standard TV mast which is not supplied).



## High Performance Hand-Held Antenna — The Hot Rod

The Hot Rod antenna can be expected to make the same improvement to hand-held communications that the IsoPole antennas have made to base station operation. **Achieve 1 or 2 db gain** over ANY 5/8 wave two meter telescopic antenna. The factory tuned HR-1 is 20% shorter, lighter and places far less stress on your hand-held connector and case. It will easily handle over 25 watts of power, making it an excellent emergency base or mobile antenna. In the collapsed position, the Hot Rod antenna will perform like a helical quarter wave. Three Hot Rods are available; HR-1 1/2 wave 2M Ant., HR-2 for 220 Mhz, and HR-4 for 440 Mhz. Amateur Net Price on all Hot Rods is \$19.95.

For either base station or hand-held operation AEA has the perfect VHF/UHF antenna. Put more punch in your Packet station with an AEA IsoPole or Hot Rod antenna. To order your new antenna contact your favorite Amateur Radio Distributor. For more information contact Advanced Electronic Applications, P.O. Box C-2160, Lynnwood, WA 98036, or call 206-775-7373.

### IsoPole Specifications

Model	144	220	440
Freq. Coverage (Mhz)	135-160	210-230	415-465
2.1 VSWR bandwidth	>12Mhz @ 146Mhz	>15Mhz @ 220Mhz	>22Mhz @ 435Mhz
Power Rating	1 kw	1 kw	1 kw
Gain**	3 dbd	3 dbd	3 dbd
Radiating Element Length	125.5" (3.2m)	79.25" (2m)	46" (1.2m)
Amateur Net Price	\$49.95	\$49.95	\$69.95

\*\*dbd — db gain over a dipole in free space

Prices and Specifications subject to change without notice or obligation.

**AEA** Brings you the  
Breakthrough!



# ANTENNA/TOWER SALE!



**hy-gain**

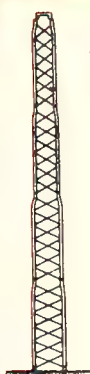
## CRANKUP SALE!

All Models Shipped  
Factory Direct—  
Freight Paid\*!

- Check these features:
- All steel construction
  - Hot dip galvanized after fabrication
  - Complete with base and rotor plate
  - Totally self-supporting—no guys needed

Model	Height	Load	Sale Price
HG37SS	37 ft	9 sq ft	\$CALL
HG52SS	52 ft	9 sq ft	\$CALL
HG54HD	54 ft	16 sq ft	\$CALL
HG70HD	70 ft	16 sq ft	\$CALL

Masts—Thrust Bearings—  
Other Accessories Available  
—Call! Prices Shown Are  
Your Total Delivered Price  
In Continental U.S.A.!



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## Self Supporting Towers On SALE! FREIGHT PREPAID

- All Steel Construction—Rugged
- Galvanized Finish—Long Life
- Totally Free Standing—No Guy Wires
- America's Best Tower Buy—Compare Save \$
- Complete With Base and Rotor Plate
- In Stock Now—Fast Delivery

Model	Height	Ant Load*	Weight	Delivered Price*
H8X40	40 ft	10 sq ft	228	\$329
H8X48	48 ft	10 sq ft	303	\$429
H8X56	56 ft	10 sq ft	385	\$499
H8X64	64 ft	18 sq ft	281	\$399
H8X48	48 ft	18 sq ft	363	\$489

\*Your Total Delivered Price Anywhere in Continental 48 States. Antenna Load Based on 70 MPH Wind.

## ROHN Guyed Tower Packages

- World Famous Rohn Quality and Dependability
  - Rugged high wind survival provides safe installation
  - Multi purpose towers satisfy a wide range of needs
  - Complete packages include: guy hardware, turnbuckles, guy assemblies, w/torq bars, concrete base, rotor plate and top section per manufacturers specs.
- Packages shown below are rated for wind zone "B" (86 mph wind). Zone "C" (100 mph wind) design prices slightly higher. All tower packages shipped freight collect from our Plano, TX warehouse, in stock for prompt delivery.

Model	25G	Model 45G	Model 55G
50'	\$ 579	1079	1439
60'	639	1209	1609
70'	689	1329	1759
80'	849	1479	1929
90'	919	1749	2089
100'	989	1899	2259
110'	1189	2019	2639
120'	1259	2179	2819



US TOWER CORPORATION

These rugged crankup towers and masts now available from Texas Towers!

- Check these features:
- ✓ All steel construction
  - ✓ Hot dipped galvanized
  - ✓ Totally self-supporting
  - ✓ No guys needed

Coax arms, Thrust Bearings  
Masts, Motor drives, Remote controls, Hinged bases, Rotor bases, & Raising fixtures also in stock.

## CALL FOR SALE PRICES!

Model	Min. Ht.	Max. Ht.	Ant. Load*	Sale Price
MA40 mast	21'	40'	10 sq ft	\$ 549
MA50 mast	22'	50'	10 sq ft	\$ 699
TX438	22'	38'	18 sq ft	\$ 829
TX455	22'	55'	18 sq ft	\$ 1249
TX472	22'	72'	18 sq ft	\$ 2059
HDX555	22'	55'	30 sq ft	\$ 1879
HDX572	22'	72'	30 sq ft	\$ 3229

Note - US Towers Shipped Freight Collect From Visalia, CA Factory

\*Note-towers rated at 50 mph to EIA specifications

## RG-213U

- \$ .29/ft \$279/1000 ft  
Up to 600 ft via UPS
- RG-213/U—95% Bare Copper Shield
  - Mil-Spec Non-contaminating Jacket for longer life than RG8 cables
  - Our RG-213/U uses virgin materials.
  - Guaranteed Highest Quality!

## RG-8X

- \$ .19/ft \$179/1000 ft
- RG8X—95% Bare Copper Shield • Low Loss
  - Non-contaminating Vinyl Jacket Foam Dielectric

## 9086

- \$ .39/ft \$379/1000 ft
- Same specs as Belden 9913
  - Lower loss than RG8U
  - 100% shielded-braid & foil

## HARDLINE/HELIX™

- Lowest Loss for VHF/UHF!
- 1/2" Alum. w/poly Jacket ..... \$ .79/ft
  - 1/2" LDF4-50 Andrew Helix™ ..... \$1.79/ft
  - 3/4" LDF5-50 Andrew Helix™ ..... \$3.99/ft

select connectors below

Coaxial Cable Loss Characteristics (DB/100 ft)					
Cable Type	Imped.	10MHz	30MHz	150MHz	450MHz
RG-213/U	50	.6	.9	2.3	5.2
RG8X	52	.8	1.2	3.5	5.8
9086	50	.4	.64	1.7	3.1
1/2" Alum	50	.3	.5	1.2	2.2
1/2" Helix	50	.2	.4	.9	1.6
3/4" Helix	50	.1	.2	.5	.9

## HARDLINE & HELIX™ CONNECTORS

Cable Type	UHF FML	UHF MALE	FML N	FML N MALE
1/2" Alum	\$19	\$19	\$19	\$25
1/2" Helix™	\$25	\$25	\$25	\$25
3/4" Helix™	\$49	\$49	\$49	\$49

## COAX CONNECTORS

Amphenol Silver PL259	\$1.25
UG21B N Male	\$2.95
9086/9913 N Male Connector	\$4.95

## ANTENNA WIRE & ACCESSORIES

- Stranded Copper 14ga. \$.10/ft 16ga. \$.09/ft  
1/4 mile 18ga copper-clad steel wire ..... \$30  
Dog bone end insulator ..... \$.79 ea.

## Van Gordon

- 1:1 Balun ..... \$11 Center Insulator ..... \$6  
Dipole Kits ..... D80 \$31.95/D40 \$28.95  
Short Dipole Kits ..... SD80 \$35.95/SD40 \$33.95  
All-band Dipole w/ladder line ..... \$29.95  
G5RV all band antenna ..... \$49.95

## ALPHA DELTA

- DX-A 160-80-40 Sloper ..... \$49

## CUSHCRAFT

- A3 3-el Tribander ..... \$229  
A4 4-el Tribander Beam ..... \$299  
A743 & A744, 30/40 mtr KIT for the A3 & A4 ea \$39  
R3 20, 15, 10mtr Vertical ..... \$275  
A5V 80-10mtr Vertical ..... \$109  
D40 40mtr Dipole ..... \$159  
D40-2CD 2-el 40 mtr Beam ..... \$299  
A50-5 5-el 6 mtr Beam ..... \$85  
215 WB NEW 15-el 2 mtr Beam ..... \$85  
230 WB NEW 30-el 2 mtr Beam ..... \$229  
4218 XL 18-el 2 mtr Beam ..... \$105  
3219 19-el 2 mtr Beam ..... \$99  
220B 17-el 220MHz Beam ..... \$99  
424B 24-el 432MHz Beam ..... \$85  
ARX2B 2 mtr Vertical ..... \$39

## hy-gain

Limited Quantities purchased at old prices. Call for current prices

- Discoverer 2-el 40-mtr Beam ..... \$199  
Discoverer 3-el Conversion Kit ..... \$199  
EXPLORER-14 SUPER-SPECIAL ..... \$199  
OK710 30/40 mtr. Add-On-Kit ..... \$199  
V2S 2-mtr Base Vertical ..... \$199  
V4S 440MHz Base Vertical ..... \$199  
TH5MK2S Broad Band 5-el Triband Beam ..... \$199  
TH7DXS 7-el Triband Beam ..... \$199  
TH3JRS 3-el Triband Beam ..... \$199  
205BAS 5-el 20-mtr Beam ..... \$199  
155BAS 5-el 15-mtr Beam ..... \$199  
105BAS 5-el 10-mtr Beam ..... \$199  
204BAS 4-el 20-mtr Beam ..... \$199  
64BS 4-el 6-mtr Beam ..... \$199  
12 AVQ 20-10 mtr vertical ..... \$199  
14 AVQ 40-10 mtr vertical ..... \$199  
18 AVT/WB 80-10mtr Vertical ..... \$199  
18HTS 80-10 mtr Hy-Tower Vertical ..... \$199  
23BS 3-el 2 mtr Beam ..... \$199  
25BS 5-el 2 mtr Beam ..... \$199  
28BS 8-el 2 mtr Beam ..... \$199  
214BS 14-el 2-mtr Beam ..... \$199  
2BDQ 80/40 mtr Trap Dipole ..... \$199  
5BDQ 80-10 mtr Trap Dipole ..... \$199  
BN86 80-10 mtr KW Balun W/Coax Seal ..... \$199

## HUSTLER

- 68TV 80-10 mtr Vert \$129 58TV 80-10 mtr Vert \$109  
48TV 40-10 mtr Vert \$89 67-144 2-mtr Base \$119  
G6-144B 2-mtr Base \$89

- Mobile Resonators 10m 15m 20m 40m 75m  
400W Standard \$16 \$17 \$19 \$22 \$26  
2KW Super \$20 \$22 \$25 \$29 \$39  
Bumper Mounts - Springs - Folding Masts in Stock!

## BUTTERNUT ELECTRONICS CO

- HF6V 80-10m Vertical \$129 Delivered  
• Full Legal Power  
• Q Tuning Circuits  
HF2V 80-40m Vertical \$129 Delivered  
• Full Legal Power  
• Automatic Band Switching  
Accessories:  
RMK II Roof Mtg. Kit ..... \$49  
STR II Stub-Tuned Radials ..... \$29  
TBR160 160m Coil Kit ..... \$49  
30m Add-on Kit ..... \$29  
20m Add-on Kit ..... \$29  
17/12m Add-on Kit ..... \$27

FREE UPS on ACCESSORIES when purchased w/antenna

## MIRAGE/KLM

- HF4B "Butterfly" 20-10m Compact Beam \$189. Delivered  
• Unique Design Reduces Size  
• No Lossy Traps  
• Turns w/TV Rotor  
KT34A 4-el Broad Band Tri-band Beam ..... \$399.95  
KT34XA 6-el Broad Band Tri-band Beam ..... \$589.95  
2m-14C 14-el 2-mtr Satellite Antenna ..... \$139.95  
2m-16LBX NEW 16-el 2-mtr Beam ..... \$169.95  
2m-22C NEW 22-el 2-mtr Satellite Antenna ..... \$179.95  
432-30LBX NEW 30-el 432 MHz Antenna ..... \$139.95  
435-18C 435 MHz Satellite Antenna W/CS-2 ..... \$179.95  
435-40CX 435 MHz Satellite Antenna W/CS-2 ..... \$209.95

## ROTORS

- Alliance HD73 (10.7 sq ft rating) ..... \$119.95  
Alliance U110 (3 sq ft rating) ..... \$49  
Telex CD 451 (8.5 sq ft rating) ..... \$CALL  
Telex HAM 4 (15 sq ft rating) ..... \$CALL  
Telex Tailtwister (20 sq ft rating) ..... \$CALL  
Telex HDR300 Heavy Duty (25 sq ft rating) ..... \$CALL  
Kenpro KR500 Heavy Duty Elevator Rotator ..... \$189  
Kenpro KR5400 AZ/EL Rotor Package ..... \$319

## ROTOR CABLE

- Standard 8 cord cables \$.19/ft (vinyl jacket 2-#18 & 6-#22 ga)  
Heavy Duty 8 Cond cable \$.36/ft (vinyl jacket 2-#16 & 6-#18 ga)

## ROHN GUYED TOWER SECTIONS

- 10 FT. STACKED SECTIONS  
20G ..... \$39.50 45G ..... \$112.50  
25G ..... \$49.50 55G ..... \$149.50  
ALL ACCESSORIES IN STOCK—CALL

## ROHN FOLDOVER TOWERS

Model	Height	Ant. Load*	Price
FK2548	48 ft.	15.4 sq. ft.	\$ 899.
FK2558	58 ft.	13.3 sq. ft.	\$ 949.
FK2568	68 ft.	11.7 sq. ft.	\$ 999.
FK4544	44 ft.	34.8 sq. ft.	\$1199.
FK4554	54 ft.	29.1 sq. ft.	\$1299.
FK4564	64 ft.	28.4 sq. ft.	\$1399.
25G Double Guy Kit			\$249.
45G Double Guy Kit			\$269.

\*Above antenna loads for 70 mph winds w/guys at hinge and apex. All foldover towers shipped freight prepaid in 48 states. Prices 10% higher west of Rockies.

## TOWER/GUY HARDWARE

- 3/16 EHS Guywire (3990 lb rating) ..... \$15/ft  
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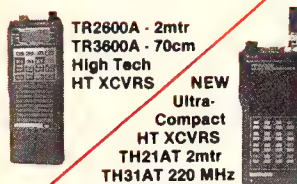
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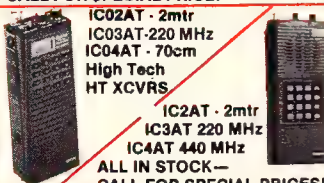
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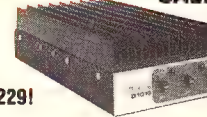
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## NEWS OF CERTIFICATE AND AWARD COLLECTING

The Story of the Month for November is:

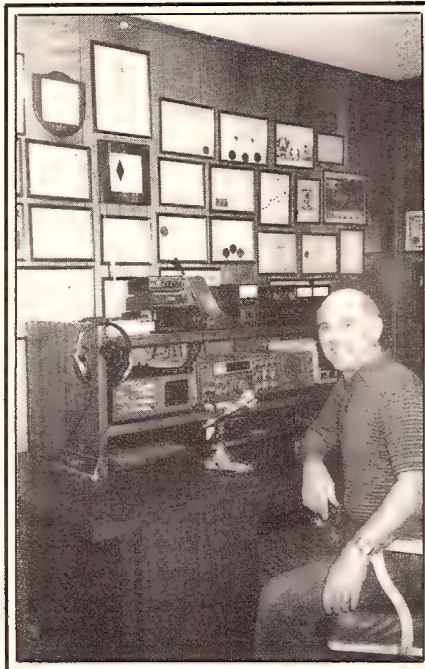
### George W. Lee, K5HT All Counties #506, 2-28-86

"Radio was of interest to me early in life, but since I had no contact with ham radio either through family or friends, my only contact was listening to a Stewart-Warner broadcast radio with a long wire strung across the top of the house. This radio is what brought news of the attack on Pearl Harbor, President Roosevelt's death, and of course VE and VJ Days. That radio is still in usable condition.

"I was first licensed as WN5CKH in 1970, passed the examination for Advanced class in 1971 and for Extra class in 1977, and received my present call, K5HT.

"My first contact with County Hunting was in 1974 or 1975. I'm not sure of the date, but I do remember the occasion. I was looking for places to further my efforts toward the Worked All States Award, and the County Hunter's frequency seemed a good place to look. A mobile station was there, and when I put in my call there was an instant response and a signal report. Boy, this was great! My response went something like this: 'Thanks for my 5 by 9 report. My name is George, located in Longview, Texas, and you are 5 by 9, 5 by 9, over.' All was well except for one thing. The Net Control Station, in no uncertain terms, explained how much time had been wasted by all my 5 by 9's, name, etc. So I thanked him and left.

"That constituted County Hunting until 1982. Saturday morning coffee get-togethers at McDonald's eventually brought me in contact with 'Uncle Ben' Relf, W5HDK, who holds USA-CA All Counties #109. He answered questions and helped me decide to give it another try even though Ben did not know why I had not pursued it in the beginning. After completing 5BWAS, DXCC, WAZ, WAC, etc., the time had come to climb another mountain. County Hunting was the logical direction. Probably the same Net Control had gone by now. By August 1982 my full-time amateur radio interest was to complete working all 3076 counties in the United States. An immediate desire to be one of the mobile stations prompted me to buy an IC-730 at the Shreveport, Louisiana hamfest that very month. Next to the friendships established, having a mobile station and running counties is by



George W. Lee, K5HT, USA-CA All Counties #506, 2-28-86, at his operating position in Longmont, Texas.

far the most rewarding part of County Hunting. I now have over 8,500 contacts while mobile and have given out counties in 19 states.

"My wife, Janet, and I have made many new friends while mobiling and attending conventions. We have attended National County Hunter conventions in Kansas City, Kansas and Coeur D'Alene, Idaho and enjoyed two trips to attend the popular Mini-convention in Manchester, Tennessee. Having a part in hosting the South Central District Mini-convention in 1984 was a big thrill for me. I was very impressed with all those people coming from Colorado, Maine, Minnesota, Wisconsin, New Mexico, and Illinois, to name just some of the states. With that convention I was sure County Hunting would occupy a large and important part of my future amateur radio activities. It gets to be more fun with each passing county.

"My special thanks to Paul Bugen, WA3TUC, without whose constant vigil in alerting me of counties I needed would have extended my attaining USA-CA by many months. Thanks, Paul. To Mike, K5OUK, and Pete, KC4IF, for those once in a lifetime expressions of friendship, thank you. Thanks also to 'Uncle Ben' Relf, W5HDK, and his co-pilot, Dorothy, who gave me my last county of them all, Sevier, Arkansas. To all my friends who drove those many miles, fought traffic,



K5HT with his certificate and plaque for USA-CA All Counties #506, 2-28-86.

heat, cold, starvation, anxiety, and opposition of many forms, thank you. With so many County Hunting friends my needs were soon reduced to none. Reward—USA-CA All Counties #506. 73, George, K5HT"

### USA-CA Honor Roll

3000				1000			
KC4OV	547	KC4OV	760	KC4OV	931		
W2CUK	548	W2CUK	761	W2CUK	932		
KA4SAX	549	WA1JYO	762	DL3DD	933		
WA1YJO	550			WA1JYO	934		
2500				500			
KC4OV	614						
W2CUK	615						
WA1JYO	616						
2000							
KC4OV	674	KC4OV	2117				
W2CUK	675	W2CUK	2118				
WA1JYO	676	I2UIY	2119				
		N2FKE	2120				
		N4KAK	2121				
1500							
		WA1JYO	2122				
KG8I	759	WG4P	2123				

The total number of counties for credit for the United States of America Award is 3076. The basic award fee for subscribers to CQ is \$4.00. For non-subscribers, it is \$10.00. Initial application must be submitted in the USA-CA record book which may be obtained from CQ Publishing Company, 76 North Broadway, Hicksville, NY 11801, for \$1.25. To qualify for the special subscriber rate please send a recent CQ mailing label. To be eligible for the USA-CA Awards, applicants must comply with the rules of the program as set forth in the revised USA-CA Rules and Program dated April 2, 1985. A complete copy of the rules may be obtained by sending an SASE to the USA-CA Custodian, 333 South Lincoln Avenue, Mundelein, IL 60060. DX stations must include extra postage for airmail reply.

### Awards Issued

Reinaldo "Ray" Alea, KC4OV, took time from his busy travel schedule to qualify for USA-CA 500 #2117, USA-CA 1000 #931, USA-CA 1500 #760, USA-CA 2000 #674, USA-CA 2500 #614, USA-CA 3000 #547, and USA-CA All Counties #514. All are endorsed All 20 M, SSB, Mobile to Mobile, 7-5-86.

Thomas L. Harman, W2CUK, sent for USA-CA 500 #2118, USA-CA 1000 #932, USA-CA 1500 #761, USA-CA 2000 #675, USA-CA 2500 #615, USA-CA 3000 #548,

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## USA-CA Special Honor Roll

Reinaldo Alea, KC4OV  
All Counties #514, 7-5-86

Thomas L. Harmon, W2CUK  
All Counties #515, 7-7-86

Mark A. Stidam, AI9Y  
All Counties #516, 7-9-86

Ira L. Bell, KA4SAX  
All Counties #517, 7-15-86

Vera M. Klecowsky, WA1JYO  
All Counties #518, 7-19-86

and USA-CA All Counties #515, Mixed, 7-7-86.

Mark Stidam, AI9Y, worked and confirmed his last few counties and claimed USA-CA All Counties #516, Mixed, 7-9-86. Mark contacted Armadillo County, Texas, so his application included 3077 counties.

Ira L. Bell, KA4SAX, got his retirement off to a good start by claiming USA-CA 3000 #549 and USA-CA All Counties #517, All SSB, Mobile, 7-15-86.

Vera M. Klecowsky, WA1JYO, qualified for USA-CA 500 #2122, USA-CA 1000 #934, USA-CA 1500 #762, USA-CA 2000 #676, USA-CA 2500 #616, USA-CA 3000 #550, and USA-CA All Counties #518, Mixed, 7-19-86.

Bob Matthews, KG8I, added a gold seal to his certificate for USA-CA 1500 #759, Mixed, 7-3-86.

Dr. Leopold Pomp, DL3DD, with his fine signal from the Federal Republic of Germany, qualified for USA-CA 1000 #933, All A1, 7-17-86.

USA-CA 500 certificates went to:

Reinaldo Alea, KC4OV, USA-CA 500 #2117, All 20 M, SSB, Mobile to Mobile, 7-5-86.

Thomas L. Harmon, W2CUK, USA-CA 500 #2118, Mixed, 7-7-86.

Paolo Cortese, I2UIY, USA-CA 500 #2119, Mixed, 7-7-86.

Enrique Perez, N2FKE, USA-CA 500 #2120, All CW, 7-14-86.

Francis H. "Frank" Dale, N4KAK, USA-CA 500 #2121, Mixed, 7-18-86.

Vera M. Klecowsky, WA1JYO, USA-CA 500 #2122, Mixed, 7-19-86.

James W. Thompson, WG4P, USA-CA 500 #2123, Mixed, 7-24-86.

## Awards Available

**New Awards from The CW Group of Rio de Janeiro.** The following two new awards are available:

**20CAW**—Work a total of 20 cities, including 5 continents, with different first letters of city names. Send log: call, date, cities, names. Fee: 6 IRC's.

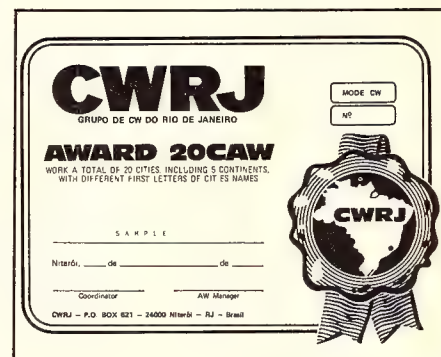
**PFAW**—Form the letters "PEACE AND FRATERNITY" with first prefix letters of stations worked. Contacts with CWRJ Associate Members may be sub-



Ronaldo Curi Gismondi, PY1EWN, Secretary for the CWRJ, at his fine station in Rio de Janeiro.



The "PFAW" Award stands for Peace and Fraternity and is offered by the Grupo de CW do Rio de Janeiro, Brasil.



The new 20CAW Award offered by the Grupo de CW do Rio de Janeiro for working 20 cities, including 5 continents.

stituted for three of the letters. Log: call, date, arranged in order to form the phrase. Fee: 6 IRC's.

Send application and fee to Awards Manager, Luiz Faria, PY2FK, P.O. Box 16681, 03197, Sao Paulo, Brasil.

**The Danu Toba Award.** The Danu Toba Award (DT/SWL-DT) is available to licensed amateurs the world over for two-way CW, Phone, RTTY, or Mixed modes. It is issued for confirmed contact with or having heard from stations in North Sumatra Indonesia (6th call area only) with the following requirements: DX stations need confirmed contact with or having heard from a total of 10 stations including at least one North Sumatra Club Station;



Indonesian amateurs need contact with or having heard from a total of 25 stations including at least 3 North Sumatra Club Stations.

Claim must be accompanied by a QSL cards list (GCR) furnished with callsigns of stations worked, dates, bands, and modes of contact. QSL cards list must be verified by the applicant's national society club station or from any two amateurs other than the applicant, that the QSL cards of the contacts listed are in the possession of the applicant and correctly listed.

For Indonesian amateurs the application must use the model-K form issued by the National QSL & Award Bureau and may be sent directly to the Award Manager for verification and award issue, or have them checked and verified by the assigned ORARI Award Checkpoint/Checkers nearest to their location.

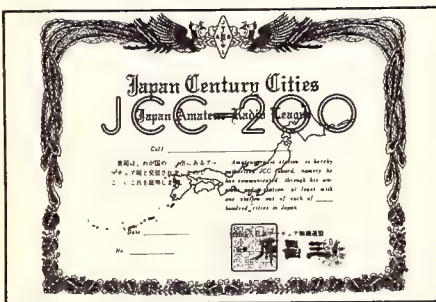
Current checkers/checkpoints are YB1DRE, YB2SV, YB2BGZ, YB2BLI, YB2CDL, YB3CDL, YB3DC, YB4FNN, YB5NOF, YB6MF, YB6TT, YB7BC, TB7UE, YB8QD, YB8AY, YB9VA, YB0JH.

The North Sumatra Club Stations (6th call area) are YB6ZAA, YB6ZAB, YB6ZAC, YB6ZAD, YB6ZAE, YB6ZAF, YB6ZAG, YB6ZAH, YB6ZAI, YB6ZAJ, YB6ZES, YB6ZZ.

A fee of \$8 US or 16 IRC's will be charged per award and should be sent along with the application to: Mr. H. Jans Fauzy, YB6MF, P.O. Box 232 Medan, North Sumatra, Indonesia.

All correspondence regarding this award should be sent to the Award Manager or to: Orari National Awards Bureau, P.O. Box 96, Jakarta 10002, Indonesia.

Note: To be valid, only contact with land station within the same country will be acceptable and all contact and listening must be made on or after July 9, 1968.



The Japan Century Cities Award offered by the Japan Amateur Radio League.

Japan Century Cities Award (JCC), SWL-Japan Century Cities Award (SWL-JCC). This award may be claimed for having contacted (heard) and received a QSL card from an amateur station located in each of at least 100 different cities in Japan. JCC-200, 300, 400, 500, and 600 will be issued as separate awards. A list of QSL cards should be arranged in order of JCC reference number, names of city omissible.

Endorsements are available for CW, AM, SSB, FM, SSTV, RTTY, ATV, and FAX.

Each list must be accompanied by a statement from the applicant's national society or from any two amateurs other than the applicant that the QSL cards of the contacts listed are in the possession of the applicant and that the items of the cards are correctly listed. If such a statement is not available, the applicant must submit all the QSL cards concerned.

A fee of 8 IRC's will be charged per award. An additional 2 IRC's will be charged for airmail delivery regardless of the number of awards claimed. If QSL cards are submitted, sufficient funds for return postage will also be required.

All applications and correspondence should be sent to: Japan Amateur Radio League, Award Section, 1-14-2 Sugamo, Toshima, Tokyo 170, Japan.

### "Team" Contacts Revisited

Some readers will recall that the subject of "team" contacts was discussed in this column in August 1985. The discussion dealt with the addition of the following (Condition 5) to the USA-CA Rules and Program effective with respect to contacts made after April 1, 1985:

"So-called 'team' contacts, wherein one person acknowledges a signal report and another returns a signal report, while both amateur call signs are logged, are NOT valid for USA-CA. Acceptable contact can be made with only one station at a time."

Recent events that have come to our attention indicate some remaining misunderstandings. The following should re-

move any doubts about the meaning of the rule.

Clearly, Condition 5 anticipates that acceptable or valid contact can be made only by way of an unequivocal and unimpeachable exchange or QSO in which one, and only one, station at either end of the exchange plays any part whatsoever. Any representation or indication that more than one station, or more than one amateur station call, at either end of the exchange or QSO is a participant calls the contact into question. Such questionable contacts cannot be accepted as part of the USA-CA Program.

Mobile station operating is governed by the same rules as fixed station operating. Condition 5 applies equally to mobile, fixed, and portable operating.

### Notes

A press release from Leo Staley, KB9XF (ex. WB9NHM, WA5AEB, WB4WDY), USA-CA All Counties #10, 5-21-69, tells of the successful first annual Competitive Amateur Radio Rally recently held by the North Shore Radio Club. The purpose of the rally is to provide the amateur radio community with an entertaining way to train operators in handling local area emergency traffic, mobile support, and local terrain familiarization. If you have questions about initiating a similar program in your local club, or if you would like details of the rally held by the NSRC, send your request to: Leo Staley, KD9XF, c/o NSRC, P.O. Box 41, Highland Park, Illinois 60035.

I hope things are going well where you are. 73, Dorothy, WB9RCY

## NEW! CODE OSCILLATOR

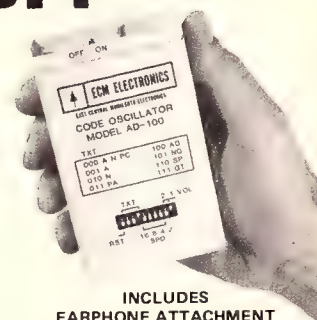
ECM Electronics introduces the most convenient way yet to learn code. This totally portable, hand-held unit sends you code no matter where you are and it's easy to use.

- 2 to 30 WPM code speed
- Four volume settings
- Weighs only a few ounces and can fit into your shirt pocket
- Powered by a 9 volt battery
- Eight practice texts to choose from
- Advanced circuitry design
- Rugged, impact resistant plastic case
- 90 day warranty on parts and labor

For more information write:



ROUTE 2, BOX 489  
MORA, MINNESOTA 55051



INCLUDES  
EARPHONE ATTACHMENT

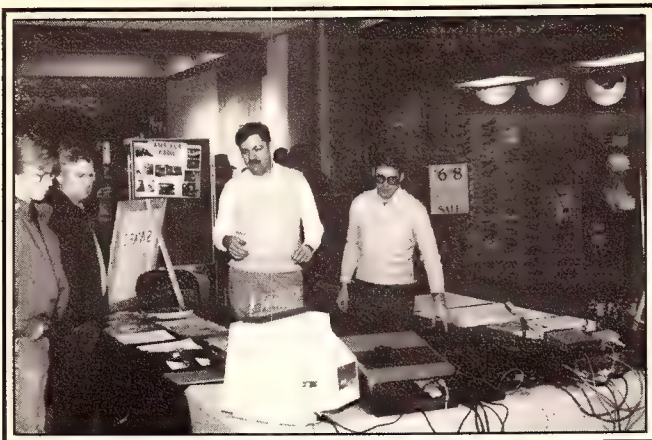
**\$79.95**  
COMPLETE

CIRCLE 60 ON READER SERVICE CARD

Only personal checks, and postal money orders accepted. First quantities limited.

CIRCLE 157 ON READER SERVICE CARD





KC8JN and N8BRN demonstrating the station.



Greg Day, KC8JN, at the operating position of our mall exhibit.

***The way to attract new people is to go where they are, not wait until they come to you. A club in Ohio did just that this year with surprising and beneficial results . . . more club spirit and new amateurs and club members.***

# Amateur Radio As A Shopping Mall Exhibit

BY JOSEPH M. PLESICH\*, W8DYF

It all started about a year ago. We were sitting around talking after one of our regular club meetings. Like many clubs, we felt we needed to attract some new members. We also felt we needed greater visibility in the community. People needed to know who we are and what we do.

Several suggestions were made as to how we should accomplish these goals. However, the one that met with the most enthusiastic response and approval was to have an exhibit at our local mall.

Our club, the Steubenville-Weirton Amateur Radio Club, isn't a very large club. We only have about 26 paid-up members. But, we put on what we feel was a very successful mall exhibit, and perhaps what was more important, it was a fun project that we all enjoyed.

As club secretary, I'd like to share with you our experiences. Perhaps our experiences might be an impetus for some of you to attempt a similar project.

Planning for our exhibit began when the club voted to do it. This is important, because if the club doesn't really want to do it, it won't be successful. Next, our club president, John Peterson, K8ZPR, appointed a committee chairperson and a committee to organize the project. This was important, too. If we were going to do it, we were going to do it right and project the proper image to the public.

Greg, KC8JN, was appointed chairperson of the mall exhibit

committee. The first thing he and I did was to contact the Ft. Steuben Mall to seek permission to have an exhibit. We were cordially received by the personnel. We explained that we were radio amateurs and that we would like some space in the next month or so to display and operate amateur radio equipment. We told them that we would not be selling anything (like raffle tickets) and that we just wanted greater visibility for our public-service activities and wanted to recruit more members for this fascinating service and hobby to which we belong.

At this point I must stop and mention that my wife and I own a business in the mall. I don't feel that this fact meant very much in getting the exhibit into the mall, but it did help us with our display area, as I will explain later.

The woman in charge of mall promotions smiled and told us that she felt that we would probably be able to have an exhibit in the mall. However, we would have to put our request in writing. We told her that she would have our letter promptly, thanked her, and left.

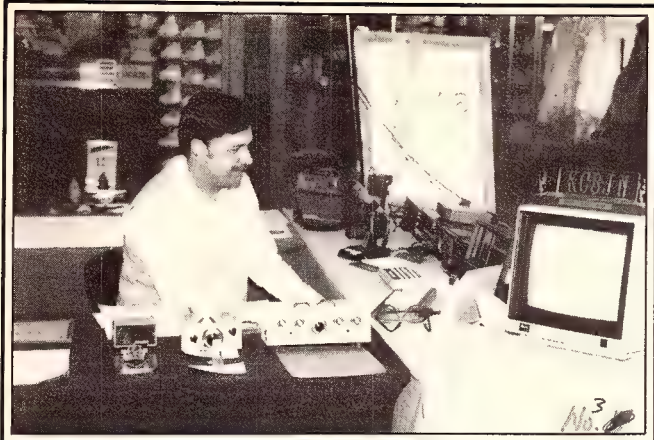
In the letter we stated the purpose of the display and the facilities we would need. I also enclosed a copy of *Join a Radio Club*, which I had obtained from the ARRL.

Two weeks passed. I hadn't heard anything from the mall, so I followed up with a phone call. There had been some personnel changes, but our request had been approved. They also gave us two tentative weekend dates to consider for our exhibit. With the commitment from the mall and some definite dates, it was now time for KC8JN to call a committee meeting.

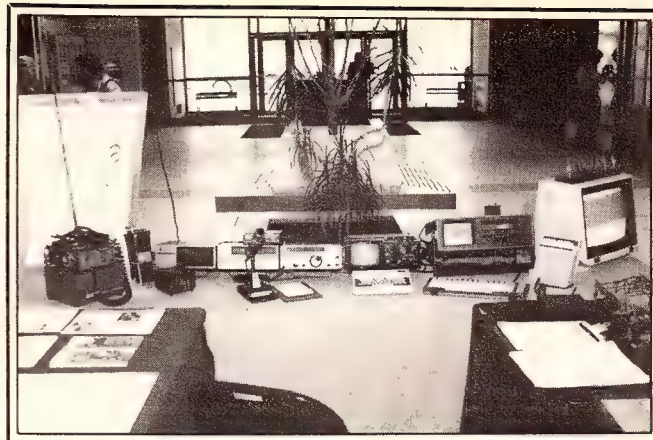
At the committee meeting we helped KC8JN make a list of

\*554 Lovers Lane, Steubenville, OH 43952





*KC8JN demonstrating equipment. Notice we have a code oscillator and key, some homebrew equipment, and computers for RTTY.*



*Steubenville-Weirton Amateur Radio Club mall exhibit facing toward the main entrance of the mall. Equipment is facing in to discourage "knob twisters." Tables are arranged in a "U".*

items we would need for our display. The main rig would be the club's Yaesu 757 with automatic antenna tuner. KC8JN said he would bring his 2 meter rig. We weren't concerned about forgetting minor items, since some of us live within a mile of the mall, and we could easily drive home and get anything we might forget.

As I mentioned earlier, my wife and I own a business in the mall, the Trinity Shop, which is a church goods and bridal shop. If one of your club members or friends owns a business in a mall, it can be a great help in setting up your exhibit.

Placement of our exhibit was right in the center of the aisle in front of our business. Our business is located near the main mall entrance, so we were assured that plenty of people would be traveling past our exhibit. This really worked out fine. Each night when the mall closed, rather than disconnect all our cables and haul all our equipment home, we just disconnected the AC and the antenna, and carried the table, equipment and all, right into our store and locked it up. In the morning we were right there to carry it back into the aisle.

We were really concerned about antennas. We knew we could work the local repeaters with an indoor 2 meter whip antenna. But what would we do for the low frequencies? Having seen other mall exhibits, we knew that there had been times when coax had been run from inside the mall to satellite dishes on the outside. Using this for an example, we approached the mall personnel and asked them if it would be possible to run some coax, which we would provide, up to the ceiling, out and across the roof above my store, then down to the ground where we would mount a five band Cushcraft vertical.

As you know, amateurs aren't usually treated too well when it comes to erecting antennas. So you can imagine our surprise, our relief, and our appreciation when we were told that it would be alright to erect the vertical, and that when we were ready to do it, they would have a man there to run the coax for us. They also even provided us with tables with skirts around them for us to use for our exhibit. The great treatment we received from the mall personnel really made it easy for us to put on an exhibit.

At four o'clock on February 29, 1986 we met at the mall. Greg, KC8JN, had most of the equipment. The rest of us had what we had agreed to bring when we had our committee meeting. The man from the mall was there to run our coax. Our antenna crew did a great job, and in about an hour the exhibit was ready for the public.

At our club meeting preceding the exhibit we had a sign-up sheet for members to list the hours they would work the exhibit. KC8JN was at the booth all weekend, and he had plenty of help because club participation was great. Just about all club members were there at one time or another. We also had many inactive amateurs stop and chat with us. Hopefully some of them will become active again.



*The five band Cushcraft vertical antenna.*

At the booth we just let people look and ask questions, which we tried to answer as simply as possible. Don't "snow" anyone with technical jargon and expertise. Due to a limited supply, we didn't pass out literature to just anyone. We waited until we had someone genuinely interested, and then we gave him or her the folder from the ARRL and another sheet we had printed up with some general information on amateur radio and our club.

We also used this opportunity to sign up members and guests for our annual dinner, which was to be held a month after the exhibit. And, we kept another sign-up sheet for a possible Novice class. (As I write this, the classes, which were conducted by KA8OWI, have just ended, and we have some new amateurs in the club.) Two items that were quite popular at our table were our club photo album (every club should have one) and a supply of 610 forms.

We had fun with the exhibit, and if you plan properly, we are sure you will have fun, too. Perhaps you can add to the information presented here. We know we'd like to do it again next year.

In closing, I'd like to thank the Ft. Steuben Mall and its very cooperative personnel; K8SVV, who provided the photos for this article; and all our club members who did a great job! **CQ**



## INFO ON AMATEUR RADIO LICENSING

### *Integrity and Credibility in the Amateur Radio Service*

*in-teg-ri-ty* n. honesty, incorruptibility, fairness, soundness  
*cred-i-bil-i-ty* n. believability, reliability, trustworthiness, confidence

**F**or seven decades, from 1912 to 1982, amateur radio operator testing was a government function—that is, except for the ham-entry-level Novice examination administered by volunteer examiners. Back in 1981 Congressman William E. Dannemeyer (R-California) pointed out that, strictly speaking, administration of the Novice exam by volunteers was illegal since government policy forbids voluntary help by private citizens in the performance of its duties.

The FCC had long been concerned about the credibility of both its amateur and commercial radio operator testing programs. As far back as 1980, FCC Chairman Charles Ferris acknowledged that broadcast industry selection of commercial radiotelephone operators was preferable to FCC testing since government examinations “do not take experience and common sense into consideration . . . and were susceptible to last minute cramming.” The Commission began dismantling its commercial radio operator testing program. The handwriting was on the wall that it wouldn’t be long before amateur radio testing followed.

#### **Background on Amateur Self-Testing**

Dick Bash, KL7IHP, said the IHP stood for “I Help People” and that he did. After flunking a ham upgrade exam, he and some friends legally collected and eventually published the verbatim questions and answers to all of the FCC’s amateur radio examinations. Bash, being a commercial airline pilot and instructor, knew that another agency, the FAA, allowed publishing of all their examination questions and answers. He also knew that the League had published amateur radio operator test questions and answers in their license manuals in the 1970s.

Bash decided to do a better job. He kept his manuals constantly up to date on new FCC questions through a system of postage-paid “feedback” cards inserted

in his book, *The Final Exam*. He solicited the new questions and the exact multiple-choice answers from amateurs who had purchased his manual and passed. Thousands of amateurs upgraded in the early 1980s by using his *Final Exam* study material. The ARRL refused his advertising. Wayne Green called him one of the most destructive forces in amateur radio in blistering editorials.

But Dick Bash actually was far from the first to publish the FCC amateur radio operator questions and answers. They more or less have been available for years in one form or another from various sources. Even the FCC Morse code exam tapes were openly sold at the giant 1982 Dayton HamVention fleamarket. People, it seems, are always trying to beat the system. The Commission became very concerned about the credibility of its testing program particularly in view of its cost to the taxpayer at a time when agency finances weren’t plentiful.

In this inflationary age, the FCC, like most government agencies, seems to run out of funding every year. With it comes FCC personnel cutbacks and field location closings. As a tax-saving measure, Barry Goldwater, K7UGA, introduced amateur radio operator self-testing in early 1982. Public Law 97-259 was signed into law by President Reagan on September 13, 1982. Tagged to it was a provision for Amateur Radio Service volunteer examination preparation, testing, and grading.

The enabling legislation only provided for the FCC accepting the voluntary and uncompensated services of amateur operators holding higher class licenses (if one existed) than the examination being prepared or administered. It fell upon the FCC to develop and implement the ham self-testing system—one that would maintain the high standards of the service.

#### **Volunteer Testing Program Issued**

On September 22, 1983 the FCC released Final Rules in Docket 83-27 calling it “a viable examination program for amateur radio operators in light of FCC budgetary constraints.” The Commission also said that 1984 would be the last year that they would administer examinations and even then testing would be quarterly. Their program provided for:

1. Examination questions submitted

by interested amateur radio operator licensees and organizations would be reviewed, and if acceptable, used to create pools of questions. Ten times as many questions would make up the pool as would be used in any one examination.

2. The pools of questions would then be published by the FCC as part of periodically updated lists of possible examination questions. These were issued in various PR (for Private Radio) Bulletins. (PR Bulletin 1035A was the Novice Element 2 200 question pool, 1035B Tech/General 500 question Element 3 pool, 1035C Advanced Element 4A 500 question pool, and 1035D Extra Class Element 4B, 400 questions.)

3. The FCC would select the questions and advise the VEC’s which questions were selected for the current examinations. This would constitute the FCC function of “designing” the examinations. Later on this function was turned over to the VEC’s, and provision was made for this ultimately to be assumed by the volunteer examiner.

4. Volunteer Examiner Coordinators, or VEC’s, acting as the link between the VE and the FCC, would assemble, print, and distribute current examinations.

5. VEC’s would accredit volunteer examiners. To protect the integrity and credibility of the new program, three volunteer examiners would administer any given examination above the Novice class. The FCC also suggested that an Extra class level VE Team Chief be in charge of the session, but later dropped this requirement.

6. Volunteer examiners are required to make a public announcement of the upcoming test session to preclude “secret” examinations. This public announcement must be made even for an examination for a single applicant (such as the handicapped) when the test session is not open to the public.

7. VEC’s would coordinate the examination session. Upon completion of an examination session, the VE’s would grade the test papers and forward the applications and test papers of successful candidates to the appropriate VEC.

8. The VEC would then screen the application for completeness and authenticity; make a record of the date and place of the test, the names of the volunteer examiners and candidates involved in that test, test results, and related information;

National Volunteer Examiner Coordinator, P.O. Box 10101, Dallas, TX 75207



issue a successful examination candidate a certificate to verify that the candidate passed the examination(s); and forward the application to the FCC licensing facility in Gettysburg, Pennsylvania for license processing.

It was the FCC—and not the legislation approved by Congress—that required the use of three examiners for amateur testing above the Novice class. Many commenters (including Dick Bash and the ARRL) opposed the three VE rule for candidates in remote areas. The Commission said that “The use of three examiners provided for cross-checking to assure the correctness of answers to examination questions, to assure proper completion of license applications, and to minimize the likelihood of any possible fraud or abuse.”

## VE, VEC Conflict of Interest

Many conflict-of-interest volunteer-examiner questions came up. Would ARRL membership for VE's constitute a conflict of interest? What about employees of manufacturers and distributors of ham radio equipment and license preparation materials? The FCC said ARRL members could indeed serve as VE's as could employees of electronic firms and publishers if they worked in a division that did not deal directly in amateur radio products. “Any employee engaged in ARRL's license preparation publishing business would be prohibited from administering an examination as a volunteer.” ARRL employees can act as a VE where the VE does not normally communicate with employees engaged in the ARRL's publishing business. A so-called “Chinese wall” was built between the testing and publishing divisions of the League.

It must be pointed out that these policies apply to volunteer examiners. Under certain circumstances VEC's can distribute license preparation materials—or even amateur radio equipment. “... where an organization seeking to be a VEC, also has publishing interest, we will accept its services as a VEC only upon a persuasive showing that preventative measures have been taken to preclude any possible conflict of interest.” The W5YI-VEC, having made this showing, is authorized to distribute license preparation materials.

By the way, one of the reasons why the FCC chose to go along with a system of regional (rather than just national) VEC's is that no expense reimbursement provisions were contained in the original legislation. They thought a number of smaller VEC's could better cope with the expense of the testing burden than just one—or a few—larger (national-in-scope) VEC's. Expense reimbursement tied to inflation was authorized by Congress during mid-1984. It was at that point that the League became a VEC in all regions.

While the VE/VEC concept has proved

very desirable indeed, not all of the comments received by the FCC supported VEC's as even being necessary. Some called it “an unnecessary bureaucratic layer likely only to add regulatory burdens and delay to the licensing process.” The FCC responded by saying, “We believe that VEC's interposed between the Commission and the volunteer examiners will lend consistency to the program by acting as coordinators of volunteer efforts, by reducing Commission and individual examiner overhead and paperwork burdens, and by screening volunteers and verifying their results.”

## Administrative Sanctions

A rule was added prohibiting VEC's from accepting the services of a prospective volunteer examiner whose amateur radio station or operator license had ever been revoked or suspended. “We believe that even if we have determined that a person whose amateur station or operator license has previously been revoked or suspended now has the requisite character and other qualifications to be a Commission licensee, that person should not be accepted as a volunteer examiner. A volunteer examiner will stand in the FCC's stead when administering amateur radio operator examinations. This position, by its very nature, demands the highest degree of integrity.”

The FCC also adopted a rule specifically authorizing the revocation of the station license and the suspension of the operator license of any volunteer examiner who participates in a fraudulent examination or who accepts payment (other than for out-of-pocket expenses) for preparing or administering an amateur radio operator examination.

## State of Current Testing

It wouldn't be accurate to say that there have not been some problems with the new Technician and higher amateur examination program. The FCC had to deal with occasional instances of fraud when they had the testing program, and the new VE/VEC system is no different. Just about every VEC has at one time or another encountered someone trying to beat the system. The system is working, however, and instances of dishonesty are few, primarily because of the many safeguards built into the new program.

Most VEC's have some sort of a VE Manual outlining procedures to follow to reduce the opportunities of fraud. No VEC is required to accredit anyone to be a volunteer examiner, and a VEC may disaccredit a VE for any reason, or even for no reason. Of particular importance is being sure that the applicant you are testing is the person who has applied for the examination. Driver's license photo identification is the best ID.

Be watchful for applicants who might bring small vest-pocket recorders into

the test session with them to record code tests. We had that happen in Indiana! Most VEC's have provisions for the written and code tests to constantly change. It is a good idea for a VE to stand at the back of the examination room and observe the activity of all applicants. Be particularly watchful for forged or fraudulent “upgrade” certificates. Safeguard all blank certificates and examination materials. Be suspicious if an applicant answers all of the code questions right, but can't put any of the characters down on paper.

No volunteer examiner may charge a license fee other than the VEC approved “expense reimbursement” amount. It is perfectly legal to charge a fee for amateur radio operator classes, but if there is any question whatsoever that the class fee might represent a disguised license preparation business, then VE's not associated with the upgrade class should be utilized. VE's charging out-of-pocket costs for classroom materials is legal; any additional charges representing “profit” are not.

Whenever there is likely to be a question about your testing someone, it is best not to. This eliminates any possible conflict of interest. Being a close relative, it isn't legal to test your wife, but you can test your girl friend. Again, it is probably best not to.

We have had cases where we have had to invalidate test sessions when the examiners did not properly follow testing instructions. It isn't pleasant to have to notify innocent applicants that their upgrade is cancelled because the appropriate number of VE's were not present, or that an unqualified VE was inadvertently accredited, but we have had to do it. Most applicants want the Amateur Radio Service to remain sound and therefore understand. Some don't and we have had to deal with law suits and Congressional inquiries.

An examination must be terminated whenever cheating is detected and the FCC's Personal Radio Branch in Washington must be notified. Don't sign an application (FCC Form 610) as a VE if you have doubts that the test session was not properly conducted. Remember, as a VE, your license is on the line.

Now in its third year, the new VE/VEC program is a smashing success! Instead of having to leave work, applicants can now be tested at hundreds of different locations during their off-duty time. The most frequent test session day now is Saturday. If the present examination rate holds up, nearly 50,000 amateurs will try to upgrade at VE sessions around the country this year.

The volunteer examiner plays a key role in determining the future of the Amateur Radio Service as we know it. Being a VE is the highest calling in amateur radio—a way for you to pay back society for



the ham radio privilege, an opportunity to influence the calibre of the service. It is important that you conduct yourself in a thoroughly professional manner. We are always interested in ways that the integrity and credibility of the Amateur Radio Service's testing program can be improved even further.

## From The Mailbag . . .

I recently upgraded to Extra class, but have not yet received my license from the FCC. Can I be accredited as a volunteer examiner? We assume you mean as a VE and that requires an Extra class license. One General class (and higher) level amateur can administer the Novice examination. In some VEC programs an Advanced class VE can ad-

minister written Element 3 required for the Technician class license. In our case, we accredit only Extra class amateurs, since only they can administer all examinations.

To answer your question, "yes." You can legally be accredited providing you have passed your Extra class requirements and hold a Certificate of Successful Completion indicating that. It is really up to the VEC, however, since a VEC can specify who gets accredited and who doesn't.

I passed my Novice requirements. Must I wait to upgrade to Technician class? No! There is no waiting period. You can immediately take the Element 3/Technician examination, but you won't have your

Novice license to append to your Technician application for about six weeks. There are some options open to you. (1) You can ask that the examiner who gave you your Novice examination give the application (FCC Form 610) back to you so you can take it to the Technician examination session; the three VE team will then use the same application. (2) If the Novice application is sent to the FCC in Gettysburg, you can still be immediately tested by the VE team for the Technician Class; the VE who gave you the Novice test should give you a note stating that you have successfully passed your Novice requirements. The note represents an "upgrade certificate." The VE team will administer the Technician class/Element 3 to you and send the application to the VEC. The VEC will hold the application until you forward them a copy of your Novice ticket when you receive it.

If you plan on immediately upgrading after passing your Novice exam, the first option is the preferable one, since it will greatly speed up receipt of your Technician class license.

Is there a cost to take a Novice examination at a regular three VE test session? Not if this is the only examination that you apply for. There is usually a fee, however, if you take and pass the Novice requirements and then attempt to upgrade further. I say usually, because while most VEC's do charge a fee, not all do, and those who do don't all charge the same amount. The maximum that can be charged during 1986 is \$4.29, although most VEC's charge \$4.25 because it is an easier figure to deal with.

The test fee is actually "expense reimbursement" to help defray VEC (and in our case, VE) expenses. The maximum amount of the fee that can be charged is determined by the FCC every October based on increases in the Department of Labor's Consumer Price Index (CPI) during the last fiscal year.

Expense reimbursement was initially (1984) tagged at \$4.00 by Congress in the enabling legislation authorizing volunteer testing in the Amateur Radio Service. In 1985 the maximum went to \$4.16 based on a 4% CPI increase. A 3.2% inflation rate for the fiscal year ending September 30, 1985 increased "expense reimbursement" to \$4.29 for 1986. Any day now VEC's expect to get a new test fee amount for 1987. While VEC's can charge a lesser amount, they cannot charge more.

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# CQ REVIEWS:

## The ICOM SM-10 Graphic-Equalized, Compressor Desk Mike

BY DAVE INGRAM\*, K4TWJ

**E**ver increasing numbers of amateurs are becoming true devotees of beautiful sounding audio, and our continuous search for the "ideal" microphone or mike element tangibly supports that statement. Indeed, the quest to regain that classic vacuum-tube-type of audio "sparkle" often leads us from mike circuit modifications to rigging various kinds of audio tailoring arrangements.

Since each amateur's "public image" and "first impressions" are directly influenced by on-the-air signal quality, such attractive audio pursuits are both logical and justified. Each person's voice characteristics are noticeably different, however, which means there's no single microphone that's perfect for everyone. Additionally, some amateurs prefer comfortable mid-range audio for casual QSO-ing and/or higher pitched response for DX penetration.

Enter ICOM's new SM-10—a four-band graphic equalized, audio compressed, VU meter equipped desk microphone with continuously variable output pot, frequency up/down buttons, and momentary or locking PTT buttons. This gem has everything except the kitchen sink, and it can be adjusted to make one's signal stand out like a shiny new car on a crowded and dirty freeway. The SM-10's graphic equalizer can provide any type of mike response desired from boom-box bass to tin-can treble. You can even make a mood preference chart of control settings and vary your transmitted sound to mate with various occasions.

The ICOM SM-10 is an impressive-looking item that closely resembles a small audio console. It measures 230 x 110 x 30 mm (W,D,H), and its all-metal



*ICOM's new four-band graphic-equalized desk mike with audio speech compressor. It works well and looks great.*

case is finished in ICOM's traditional gray. The mike may usurp a few more inches than usual of one's desk room, but its features more than offset that inconvenience. The SM-10 is supplied with a 3 foot cable and 8-pin mike plug for mating with ICOM's presently popular transceivers. It's thus plug-in compatible with the 735, 745, 751A model HF transceivers, plus the 3200, 27A/H, 32A, 45A, 47A, 271A/H, 471A/H (great for OSCAR!), 120, and 1271 VHF/UHF transceivers. The mike's required 13 volts at 15 ma operating power is obtained, and its output au-

dio is connected to its host transceiver via its single mike cable.

### A Closer Look

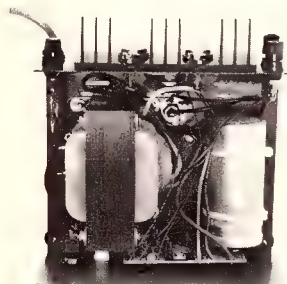
Since the SM-10 is essentially a super deluxe microphone, it can be understood easily through a visual tour of its top panel's controls (see the photo). The mike's graphic equalizer consists of four slider-type potentiometers mounted on the left side. The pots are calibrated in both audio frequency response and dB gain or attenuation. The frequency range of each pot is 250 Hz (bass), 600 Hz, 1200 Hz (mid

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- INPUT VOLTAGE: 105 - 125 VAC
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MODEL RS-50A



MODEL RS-50M



MODEL VS-50M

### RM-A Series

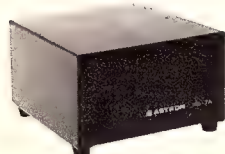


MODEL RM-35A

### 19" X 5 1/2" RACK MOUNT POWER SUPPLIES

Model	Continuous Duty (AMPS)	ICS* (AMPS)	Size (IN) HXWXD	Shipping Wt. (lbs.)
RM-35A	25	35	5 1/4 x 19 x 12 1/2	38
RM-50A	37	50	5 1/4 x 19 x 12 1/2	50
• SEPARATE VOLT & AMP METERS				
RM-35M	25	35	5 1/4 x 19 x 12 1/2	38
RM-50M	37	50	5 1/4 x 19 x 12 1/2	50

### RS-A SERIES



MODEL RS-7A

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H x W x D	Shipping Wt (lbs)
RS-4A	3	4	3 3/4 x 6 1/2 x 9	5
RS-7A	5	7	3 3/4 x 6 1/2 x 9	9
RS-7B	5	7	4 x 7 1/2 x 10 3/4	10
RS-10A	7.5	10	4 x 7 1/2 x 10 3/4	11
RS-12A	9	12	4 1/2 x 8 x 9	13
RS-20A	16	20	5 x 9 x 10 1/2	18
RS-35A	25	35	5 x 11 x 11	27
RS-50A	37	50	6 x 13 3/4 x 11	46

### RS-M SERIES



MODEL RS-35M

- Switchable volt and Amp meter

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H x W x D	Shipping Wt (lbs)
RS-12M	9	12	4 1/2 x 8 x 9	13
RS-20M	16	20	5 x 9 x 10 1/2	18
RS-35M	25	35	5 x 11 x 11	27
RS-50M	37	50	6 x 13 3/4 x 11	46

### VS-M SERIES



MODEL VS-20M

- Separate Volt and Amp Meters
- Output Voltage adjustable from 2-15 volts
- Current limit adjustable from 1.5 amps to Full Load

MODEL	Continuous Duty (Amps) @13.8VDC@10VDC@5VDC	ICS* (Amps) @13.8V	Size (IN) H x W x D	Shipping Wt (lbs)
VS-20M	16 9 4	20	5 x 9 x 10 1/2	20
VS-35M	25 15 7	35	5 x 11 x 11	29
VS-50M	37 22 10	50	6 x 13 3/4 x 11	46

### RS-S SERIES



MODEL RS-12S

- Built in speaker

MODEL	Continuous Duty (Amps)	ICS* Amps	Size (IN) H x W x D	Shipping Wt (lbs)
RS-7S	5	7	4 x 7 1/2 x 10 3/4	10
RS-10S	7.5	10	4 x 7 1/2 x 10 3/4	12
RS-10L(For LTR)	7.5	10	4 x 9 x 13	13
RS-12S	9	12	4 1/2 x 8 x 9	13
RS-20S	16	20	5 x 9 x 10 1/2	18



range audio), and 2400 Hz (treble), and the level of each pot can be adjusted  $\pm 12$  dB from its center zero of "flat response" point. Moving the two low-frequency pots up 6 dB and lowering the two high-frequency pots down 6 dB from zero creates what I call a "sock over the mike" bassy sound. Raising the two middle pots 9 dB yields a telephone or phone-patch type sound. Raising the 1200 Hz pot 3 dB and the 2400 Hz pot 12 dB while leaving the other two pots at mid-zero dB gives a pure crystal mike sound. I've personally found "stagger setting" the pots from  $-6$  dB for 250 Hz to  $+6$  dB for 2400 Hz yields sparkling and crisp audio for my particular voice, and unsolicited audio compliments are commonplace.

There are two slider switches on the SM-10. One controls equalizer and compressor on/off, and the other selects low, medium, or high audio compression. The unit's output pot controls overall mike gain or sensitivity. On the right side are two momentary pushbuttons for PTT. One acts as a "normal" PTT; briefly tapping the other one electrically locks the PTT on transmit. Tapping the "normal" PTT returns the rig to receive. Meanwhile, a small LED below the VU meter blinks to signify transmit mode. The VU meter functions during both transmit and receive. Thus, it's useful for checking background noises or level settings. The meter is not illuminated, but that's no big deal. The mike's up/down buttons are handy for rig tuning, and extremely small frequency changes are possible by repeatedly tapping either one. Finally, the mike's gooseneck stand can be bent into any imaginable shape. The windscreen can be removed for increasing high tones, but that's not necessary, since the graphic equalizer can provide any mike response imaginable.

### Using the SM-10

Since more folks are exposed to my

voice than my personal appearance, I'm continuously seeking the "ultimate" sounding microphone. Initially, adjusting and testing the SM-10 thus resembled turning a kid loose in a candy store. After connecting the mike to my IC-27A and adjusting the equalizer while monitoring audio on a handheld talkie, my 2 meter FM signal sounded like a broadcast station. Adding a "touch" of high tone pre-emphasis merely involved raising the 2400 Hz pot 3 or 4 extra dBs.

The SM-10 was next connected to our IC-735 and equalizer-adjusted while monitoring on my classic Collins KWM-1 (using its 3.1 kHz mechanical filter). Again, a few extra dBs of highs were added to create that special "sparkle" in transmitted audio. The results were everything desired, and signal quality compliments became a usual part of QSO returns. In fact, many amateurs called merely to ask what type of rig and mike we're using. I love it. As previously mentioned, the SM-10 can produce any type of response you desire. Just monitor the transmitted audio on a separate receiver and set the equalizer according to your own voice. Begin with all four pots at zero dB (flat response), and then move each in small steps (3 dB) and notice the differences until you reach "perfection." Remember to use low power and a dummy load during those tests. I suggested using an extra receiver rather than a transceiver's internal monitor for audio checking to acquire an overall perfect response. I've found that any rig—regardless of manufacturer—can have a slightly different transmit IF response, and compensations (within reason) can be achieved in (prior) audio stages.

The SM-10's internal amplifier and gain control allow it to be "worked" from any distance. You can "eat the mike" or talk from 2 feet away. Nice. When the SM-10's audio processor and its host's transceiver's IF processor are used in

### 1. GENERAL

- Current drain (13.8V DC):  
EQUALIZER ON Approx. 15mA  
EQUALIZER OFF Approx. 8mA
- Dimensions:  
230mm(W)  $\times$  110mm(D)  $\times$  30mm(H)
- Weight:  
1.9kg

### 2. MICROPHONE UNIT

- Microphone:  
Broadband electret condenser
- Number of semiconductors:  
Transistors 10  
Diodes 5
- Type of microphone:  
Uni-directional
- Output impedance:  
100 $\Omega$
- Output level:  
0 ~ 30mV
- Compression level:  
HIGH 45dB  
MED 35dB  
LOW 10dB


### 3. EQUALIZER UNIT

- Number of semiconductors:  
ICs 3  
Diodes 1
- Signal-to-noise ratio:  
80dB
- Distortion:  
0.05%
- Equalizer:  
4 stages ( $\pm 12$ dB)

Fig. 1—Specifications of ICOM's new SM-10 desk mike.

tandem, a quite effective DX tool is produced. I do advise watching the mike's VU meter, however, as background noise can sneak up quickly under those circumstances.

### Summary

All aspects considered, the SM-10 is a very impressive unit. It makes me sound better on the air than I do in person, and it adds sparkle to SSB audio. It's a gem. My only complaint is that it's not available in a handheld mobile version. I look a bit strange with the thing strapped around my neck while driving down the street. The SM-10 is available from amateur equipment dealers nationwide and worldwide, and it's backed by ICOM's outstanding warranty. For more information, contact ICOM America, Inc., 2380 116th Avenue, N.E., Bellevue, WA 98004. 

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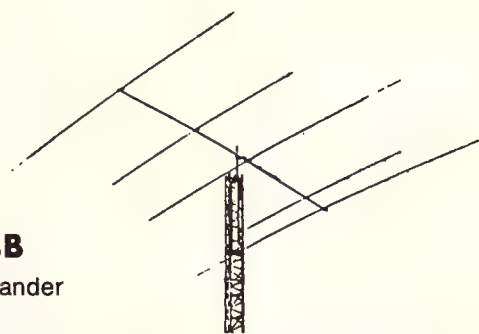
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F/B Ratio dB Avg.	18	Boom Length	30 ft
F/S Ratio dB	30	Weight	148 pounds
VSWR	MAX 1.8	Wind Survival Rate	80 mil/h
Power Capability			
CW/PEP KW 2/4			
CW: 50% Duty			



### 318B

Tri Bander

Frequency MHz	14 21 28	Element Length Max	28 ft
Front Gain dB Avg.	7.5 9 9.5	Boom Length	21 ft
F/B Ratio dB Avg.	20 18 20	Mast Diameter	2"-2 1/2"
Power Capability		Weight	49 pounds
CW/PEP KW	1/2 1/2 1/2	Wind Survival Rate	90 mil/h
CW: 50% Duty		Rotational Radius	17.4 ft
Impedance	50 ohms		

### RC5A-3

ANTENNA ROTATOR



Indicator Control



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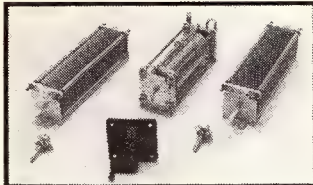
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## A LOOK AT THE SHACK FROM BOTH ENDS OF THE COAX

### Hamshack Computers: Part IV

W8FX continues his examination of the PC in the hamshack with Part IV. In the first three installments he looked into computer selection, installation, and operation. This time he discusses requirements for computer care and maintenance. Check out this month's installment to help keep your micro's chips feeling chipper. —K2EEK

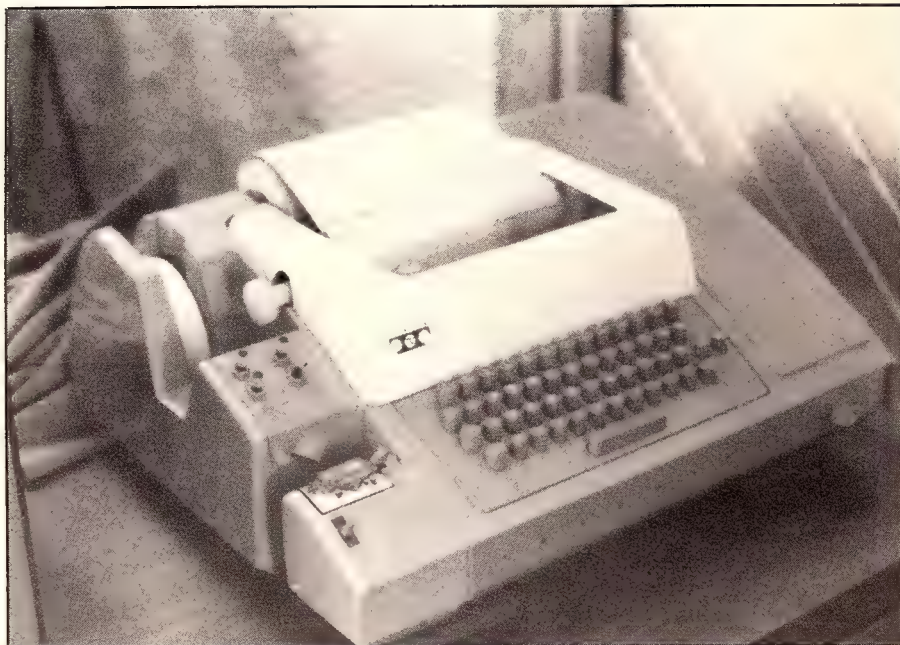
Last time we continued our series on the hamshack personal computer (PC). After discussing computer selection and installation in previous columns, we followed up with a number of specific hamshack applications. We also presented some general operating tips and procedures. This month we'll peer into computer care and maintenance, with the view to helping you ensure that your PC's chips don't go down prematurely. We'll also take a look at some new hamshack reading matter and software.

#### Computer Care

It's not necessary to assume that "computer troubles" will inevitably strike your equipment. Computers and associated peripherals tend to be quite reliable. When something does go wrong, it's not the end of the world, in that what's gone wrong can be fixed. Nevertheless, it's important to focus on three major aspects of the computer care and maintenance equation: preventive maintenance, problem analysis, and repair. Let's put them into perspective.

**1. Preventive Maintenance.** Computers tend to need little routine maintenance, though a few preventive maintenance tips and procedures are in order. We've touched on some of these mostly common-sense items previously, but it's useful to review and amplify them here. After all, as in many aspects of life, a little prevention up front may eliminate the need for hindsight later on.

Keep your PC clean, and don't eat, smoke, or drink around the computer system. Don't operate the computer in environments in which a great deal of dust or other foreign particles will be encountered. It's best to keep the computer equipment (and especially the keyboard) covered when not in use. Keep the computer hardware away from windows, in order to prevent exposure to direct sunlight and to weather elements. Provide good ventilation for the computer, especially if power-consuming accessories and circuit board "cards" have been installed inside the PC. Treat all power cords and connecting cables with care, keeping in mind that internal conductors can be broken or short out, thus causing malfunctions. Ensure that the PC is operated through a power strip and surge suppressor to prevent



"Mechanical marvels" such as this required a good deal of maintenance to keep them running. Modern computer equipment requires little in the way of maintenance, though a little preventive "TLC" (tender loving care) can go a long way toward keeping your system up and running. This column has some computer care and maintenance tips you should find useful. (W8FX photo)

possible damage from powerline transients. If a modem is used, it's best to isolate it from the telephone line when not in use.

External disk drives should also be provided with adequate ventilation, particularly if they will be operated for extended periods of time. When the drives are not in use, their doors should be closed to prevent dust, dirt, and foreign objects from entering. Keep the area around the drives clean, being on the lookout for small pieces of wire, solder, screws, and the like, which can enter through the drive access door opening. The disk-drive heads should be kept clean, either by cleaning the heads directly or by using a commercial head-cleaning kit (be sure to check out head cleanliness before assuming you have a head alignment problem or other major drive malfunction). The disks themselves should be safely stored away in their protective sleeves when not in use to keep out dust and to prevent scratching. The disks should not be subjected to extremes of heat or humidity. They are best stored in special disk holders designed for the purpose.

Interconnecting cables give a lot of trouble. Indeed, many annoying intermittent computer problems can be traced to dirty connectors and card "fingers." Make sure that all plugs and connectors are firmly seated, and that there is not pressure on them; a crooked plug may make poor contact or cause a disastrous short circuit. Periodically clean the comput-

er's and peripherals' various port connectors and plugs with alcohol or contact cleaner (but take care to only do this when the power is off).

The keyboard is a frequent source of erratic computer operation. The surface of the keyboard is the area most likely to receive a build-up of dirt, oil, and grime, which may gravitate inside. An obvious preventative here is to wash your hands before using the keyboard. A weekly cleaning with a slightly damp cloth should keep the keyboard in good condition; lightly blowing it out from the outside using a "mini-vacuum" is a good idea, too. On some keyboards it's possible for the user to open the board and clean the contacts. However, this should only be attempted if you know exactly what you're doing.

**2. Problem Analysis.** Sooner or later you may have computer problems—welcome to the "club." These difficulties may be small and irregular, such as problems in loading or saving data, or you may one day find that the computer refuses to come to life at all when the power switch is thrown. Your problem then is to find the source of the problem, assessing whether the malfunction represents operator error, hardware failure, or software failure, or possibly some combination of these.

The first prerequisite for educated troubleshooting is a basic familiarity with all of the hardware and software components of your system. Two basic troubleshooting rules apply: (1) that of going from the simple to the com-



plex; and (2) the substitution of working peripherals, cables, chips, or software to isolate the problem, thereby systematically eliminating the variables. Deciding what's wrong is not always easy. However, you can try to recall if the problem ever appeared before, and what steps you took to cure the malfunction. Trying to reproduce that situation may be useful. Needless to say, if you're not sure of what you're doing, don't do it!

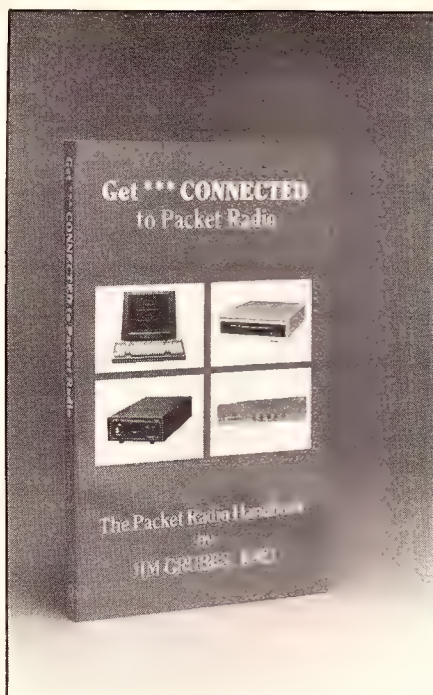
Before assuming a hardware or software problem, consider the possibility of operator error. Even the most experienced computerists make mistakes; modern computer systems are so complex that depressing the wrong series of keys can lock up the computer. Be sure to refer to the hardware and software users' manuals to check for the possibility of a wrong, omitted, or out-of-sequence procedure causing your apparent computer malfunction. Many of the better users' manuals have extensive troubleshooting sections that can help you pinpoint perplexing problems.

If you suspect hardware problems, bear in mind that identifying which piece of hardware is responsible for your problem is largely one of substitution. If you can, take your entire system to the home of a like-equipped individual. Swap out equipment, trying to isolate which of your system's components is defective. In general, hardware swapping is fairly safe, although if your power supply is bad, it's possible that a bad supply might damage the other PC. Diagnostic programs are available for most computers to check major chips and ports in your computer, as well as the disk drive's alignment. While these programs are most useful to someone with good computer technical skills, the programs are nevertheless helpful in alerting you to potential problem areas.

If you're fairly comfortable in opening your computer's case, you can look for the obvious problems, such as poorly seated chips, loose cables, and the like. However, unless you are a skilled computer technician, it's unwise to go much beyond this point with your diagnosis. You may wish to merely satisfy yourself that the problem isn't an obvious thing such as a chip nearly out of its socket, or an edge card that's become dislodged.

Software failure can result from electrical or physical damage to your program or data disks. Are problems confined to a single program or file, or do they relate to most or all software? Use backup disks if you have them available, and try your suspect disks in a friend's disk drive. Be sure to determine whether you're using any additional peripheral equipment with your system that may be interfering with proper operation of a program: a new keypad, modem, "card," fast loading device, printer, etc. If so, disconnect the device and try to repeat the problem. Consider, too, that if software problems occur only in one routine of a particular program, they may represent errors or "bugs" in the software. Certain program problems, particularly those relating to printouts, may be the result of an incomplete or erroneous installation of the program on your computer. In this case, you should carefully reread the software's installation instructions.

**3. Computer Repair.** Few of us, even those of us who aren't afraid to poke around inside a ham transceiver, are comfortable doing any but the most superficial of computer repairs. For most, the watchword is (or should be), if you're not sure of what you're doing, don't do it. Nevertheless, even if you don't do your own



*Whether you're already on packet or are just thinking about getting on with "the packet revolution," Jim Grubbs, K9EI's new book, shown here, is excellent for both the beginner and the intermediate packeteer. Jim's book contains more than 200 pages and is available from CQ's Book Shop.*

repairs, there are some repair considerations to keep in mind.

A disciplined check of the complete computer system and/or the software in question is invaluable for the time when you turn over your computer to a professional technician for repair. Isolating which component of your system is the likely culprit is an important step in getting your system repaired expeditiously and avoiding costly "false starts" and callbacks. Jotting down notes as you went through the troubleshooting process of elimination is invaluable to assist the technician in diagnosis. You should be able to save the technician time and yourself money by completing a solid preliminary diagnosis.

While technical repair information is beyond the scope of this article, if you're so inclined you can get a good deal of computer repair information in magazines such as *Radio-Electronics* and *Personal Computing*, as well as many machine-specific computer magazines, which frequently run repair articles. Users' groups constitute a good source of technical and repair information. Too, local trade and technical schools and junior colleges offer computer repair courses, as do national correspondence schools. If you want to do some serious work on your PC, then you'll want to obtain the manufacturer's technical or service manual.

Where to take your PC for repair? The exact answer to this question depends on your particular brand of PC. The PC's user's manual should contain specific instructions on obtaining warranty and non-warranty repair. With some makes, there will be no local service center, and you will have to box up your system for shipment to a distant repair depot. Again, users' groups can share members' experi-

ences with repairs; bear in mind that knowledgeable repairmen interact with users' groups and may advertise their services in their newsletters and on their computer bulletin boards. Too, many technically qualified hams who do work on ham gear may also work on some brands of computers, so consider that possibility also. There is a risk, though, in giving your machine for repair to an independent repairman, as he may not have access to up-to-date schematics and repair information, and obtaining parts may be difficult or impossible for anyone not recognized by the manufacturer.

When automobiles, TVs, VCRs, and other technological marvels made their appearance, their breakdown often signaled traumatic situations. While breakdowns of these devices still occur, we've learned to control them and to deal with the problems of maintenance and repair. So it is with computers, which represent just another, albeit "hi-tech," type of machinery. With proper care and repair, a computer will last for many years and will continue to do the job it was designed to do.

## From the Bookshelf

*Get \*\*\*Connected to Packet Radio.* No matter where you turn these days, there is one subject that is sure to come up: packet radio. Billed as "The Packet Radio Handbook," Jim Grubbs, K9EI's new book is the first book I have seen that is devoted exclusively to packet radio operation. Its three major sections cover packet radio from the beginning through intermediate levels.

In the first chapters Jim examines packet radio history. For those considering the purchase of a technical node controller (TNC) for packet radio, information and comparisons are provided on several popular commercial designs. Following chapters take the reader through a step-by-step process leading to a successful first packet radio contact. The introductory section continues with information on possible problems, useful commands, and a discussion of HF versus VHF packet operation. Information on where to find additional packet information (magazines and newsletters) is included.

A second section includes more advanced information. Details on using the Xerox 820 computer as both a packet terminal and a packet bulletin board are included. A chapter on accessories examines most everything from special software to connect alarms. The book's final pages include details on special packet operations, including bulletin boards, and an appendix includes a handy glossary, bibliography, address list, frequency table, and command summaries.

The 200-page paperback is available for \$12.95 plus \$2.00 shipping and handling from CQ's Book Shop. We should note that Jim is also the author of *The Commodore Ham's Companion* and the "Command Post" series of reprints, which we described in the February Antennas & Accessories column.

**Two from W5QJR.** We had the opportunity to have an "eyeball QSO" with Ted Hart, W5QJR, at this spring's Orlando Hamcation. Ted is an intrepid antenna designer and experimenter who has two interesting books to his credit. The first of these is *The Rules of the Antenna Game*, subtitled "What Every Ham Must Know About HF Antennas." A highly readable and practical book, it was written with the idea of clearly presenting the rules of the antenna game as Ted sees them, especially for the ben-



efit of the new amateurs and those without a technical background. The reader is led through antenna design, construction, and testing to show just how simple it really is to build a good-performing antenna, if some of the key rules are kept in mind. Ted presents some 10 antenna rules, really truisms that should be followed for best results, and he includes some 30 figures in his 41-page book to amplify his discussion. Both vertical and horizontal antennas are covered. The book represents an excellent primer for the beginner.

Ted's other book is *Small High Efficiency Antennas*, which is intended to showcase the virtues of transmitting loop antennas. In this book he attempts to dispel the belief that the loop is practical and efficient only for receiving. He shows, in his 92-plus page book, that the physically small rectangular or circular loop can represent an efficient and effective HF antenna, provided that large-diameter tubing is used, the loop is capacitor-tuned (rather than inductor-tuned), and the loop is between  $\frac{1}{8}$  and  $\frac{1}{2}$  wavelength in diameter. Ted's book, which contains loop construction details that practically anyone with a hacksaw can follow, should be of particular interest to the small city lot or apartment ham, who may have given up operation on the lower HF bands, such as 160, 80, and 40 meters.

Ted's books are available for \$5.95 and \$11.95, respectively, plus \$1 shipping and handling. They are available from W5QJR Antenna Products, P.O. Box 334, Melbourne, FL 32902.

**Apple Graphics.** Bill DeWitt, W2DD, did CQ's slowscan column for many years. We note now that Bill has a new computer book on the stands, *HiRes/Double HiRes Graphics for the Apple IIc and Apple II Family*. Designed for the computerist who is interested in advanced color graphics, Bill's book provides the tools needed to paint and draw advanced graphics. The book includes all necessary programming and operational details, with explanations of low and high resolution commands, a discussion of shapes and shape tables, and numerous demonstration programs. His guide also explains a variety of techniques for generating graphics by modifying off-the-shelf graphics packages. With its clear explanations and complete instructions, the book should open up a new world of computer graphics possibilities for the serious Apple user. Bill's book (ISBN 0 471-83183-2) is published at \$16.95 by the Wiley Press division of John Wiley & Sons, Inc., 605 Third Avenue, New York, NY 10158.

## Software of Note

**Ham Data Co. Update.** Ham Data's proprietor, Chip Lohman, NN4U, has been cranking out Commodore-based software since 1982, and we've featured Chip's software before in our column. To review, Chip offers several inexpensive but full-featured C-64 logging programs, including Master Log™, Super Log™, and Contest Log™; a code-training program, Computer Morse™; and several "DX tools" such as Propagation Chart™, Antenna Design™, and the new DX Tool Kit™. The latter two programs should be of particular interest to readers of this column.

Antenna Design is an antenna experimenter's package that is designed to aid in the trial-and-error process of antenna development. It performs all the math required for initial specifications, and helps keep track of final dimensions and other important adjustment data. The program includes features such as an on-

screen calculator, metric to English conversions, printer screen dump, on-screen or printed SWR curve chart, and an inventory or record-book section. The record book allows you to keep track of various antenna parameters and settings, such as type and number, switch positions, adjustment date, dimensions, notes, etc., which can be saved to disk for future reference. The program also computes the resonant length for transmission lines, matching stubs, and various types of antennas. Standard value or custom velocity factors may be used when calculating transmission lines.

I particularly liked the program's record-book feature. The ability to systematically record and store various antenna design parameters and experimental results, including SWR measurements, is very handy, and puts this \$9.95 gem in a class above most of the similar antenna design programs I've seen. Fig. 1 shows a record for a hypothetical experimental antenna, while fig. 2 is the SWR chart for that antenna as produced by the Antenna Design program. Both of these printouts were generated from records that had been saved to disk.

DX Tool Kit is Chip's newest program (at \$24.95), and it incorporates the features of his earlier Propagation Chart program, a beam heading and long path generator, a grayline calculator, and a sunrise-sunset routine. The menu-driven program is one of the first that allows integration of propagation conditions, beam heading, and sunrise/sunset determination in a single program, although several programs are on the market that perform some of these calculations.

The Propagation Chart portion of DX Tool Kit is based on the MINIMUF 3.5 algorithm, and it computes both the MUF (maximum usable frequency) and FOT (frequency of optimum transmission), as well as a general beam heading and distance to receiver. The Beam Heading program module produces a custom beam-heading chart from your QTH to over 400 locations; both direct and long paths are displayed. The Sunrise module allows you to forecast your sunrise and sunset times, to make rough estimates of future grayline conditions. The Grayline module allows you to take advantage of potentially unique dusk and dawn conditions, by listing those QTHs along the grayline, that are within up to 30 minutes of your sunset and sunrise. Armed with Grayline, MUF, and beam-heading information, your chances of making contact with that "rare DX" are, of course, greatly improved over seat-of-the-pants techniques. Fig. 3 is a typical grayline chart produced by the DX Tool Kit, and it shows sample sunrise and sunset targets from the author's QTH.

For more information, contact Skip Lohman, NN4U, at Ham Data Co., 3331 Bybrook Lane, Woodbridge, VA 22192.

**HAM-PAC.** From Glen Gardner, Jr., AA8C, comes word of HAM-PAC, a continually updated collection of useful and interesting Commodore 64 disk-based programs for the amateur and the electronic hobbyist. HAM-PAC, which has gone through several versions and enhancements, consists of at least seven programs. These have included a Morse code trainer, a CW keyboard program, a computer-assisted electronic design program, two graphics drawing utilities, a logging program, and a disk copier. While some of the early program versions had some bugs, Glen has worked hard to update his programs, and he

Antenna Design Program Record Book Sample		
ANTENNA # 2	FREQ	SWR
	3.500	8
ANTENNA TYPE: LONG WIRE	3.507	7
	3.514	6
SWITCH POS: 2	3.521	5
	3.528	4
ADJUST. DATE: 860627	3.535	3
	3.542	1
DIMENSION:	3.549	1
	3.556	3
760 FEET 0 INCHES	3.563	4
	3.570	5
TOWER BLANK		
REM: 3(RADIATOR) AT 100 %		

Fig. 1—Antenna design program record book sample. Shown here is a record for a hypothetical experimental antenna, as maintained by the Ham Data Antenna Design program. See text for details. This program is offered by the Ham Data Co., 3331 Bybrook Lane, Woodbridge, VA 22192.

has a very liberal and inexpensive program upgrade policy. HAM-PAC is available from Glen for around \$12.50 postpaid; check with him for the current HAM-PAC version, the set of programs offered, and price.

Glen also offers a C-64 database program, FILEMASTER, for \$9.50. The menu-driven program is designed to handle small files with speed, and it makes use of single key commands for simplicity. A set of disk-handling commands is also included. As this column is written, the program is available only for the C-64, but by the time this appears in print, a C-128 version should be available.

Glen offers some interesting comments regarding the C-128, from a software developer's viewpoint: "One thing I have noticed about the 128 is that the only real difference between it and the 64 is its massive, bank-switched memory. However, even the 64 employs this technique to an extent. From a development standpoint, there really is little difference between the C-64 and the C-128. The graphics are the same, the screen is the same, the disk I/O is the same (or pretty much so). This means that the only advantages one might have with the 128 are easier programming with BASIC V7 and increased memory capacity. I think that most of the software written for the C-128 mode will emphasize the 128's memory capacity. Anything else might as well be written for the C-64 mode, in order to reach a larger customer base."

For more information, contact Glen E. Gardner, Jr., AA8C, PO Box 387, Chillicothe, OH 45601.

**New from Epyx.** Anyone who reads our column knows that we're strong supporters of Commodore computers: they're inexpensive and capable, and the ham software base for them is the largest of any PC. We recognize the limitations, as well, which focus primarily on the C-64's 40-column screen, limited memory, and especially, super-slow disk-drive access.

In the November 1985 column we mentioned some disk-drive enhancement utilities, such as the Epyx FastLoad™ utility cartridge which significantly speeds up disk loading op-



# SWR CHART FOR ANTENNA # 2

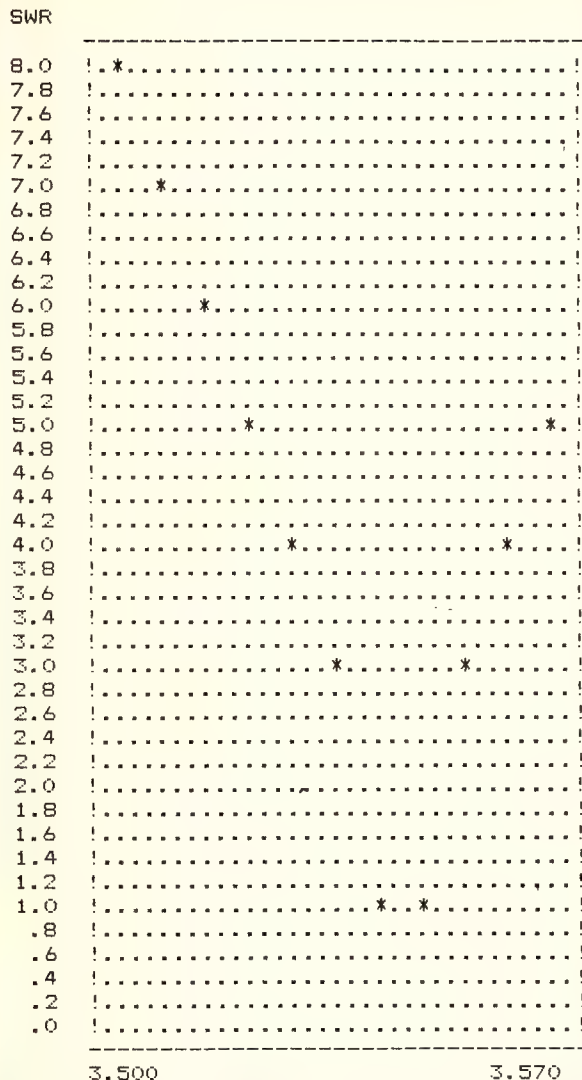


Fig. 2.—Antenna design program SWR chart sample. This SWR chart as printed out by the Antenna Design program was produced from the data contained in the "antenna record" shown in fig. 1.

erations by up to a factor of five. FastLoad has since been joined in the marketplace by several competitors with products that have similar features, such as Access Software's Mach5™ and Mach128™ cartridges, and Pro-Line Software's GT4™ speedup utility, all of which have found a welcome home in hamshacks. Epyx has come up with something entirely new, however, known as the Vorpai™ Utility Kit.

This is a disk-based product which allows the Commodore 64 (or C-128, operated in C-64 mode) to handle a new type of disk file, the Vorpai file. Files which have been saved in this format load up to 25 times faster than do normal disk files. The Epyx disk provides all of the tools needed to work with Vorpai files on the Commodore 1541 and 1571 disk drives. The package also includes several useful disk manipulation utilities—disk and file copiers, file utilities, and a head alignment/speed check.

Using this utility package, one essentially takes a "normal" BASIC program file and converts it to a Vorpai-style file in order to make it suitable for high-speed loading. Vorpai files are loaded as usual into the computer, but a special loader must be placed on the program

disk, or already be in the computer's memory, for the "Vorpalized" files to be loaded. None of this file manipulation is complicated, however, and I can see where this special file format has great potential for working with very long BASIC programs, which can now load in a matter of a few seconds. I should note that BASIC programs work fine in the Vorpai format, though some machine-language programs do not. Epyx feels very confident about the utility's potential, as it has indicated that the Vorpai Fast Loader will be incorporated in future Epyx products for the C-64 and C-128. If you write your own C-64 programs, this utility is probably for you!

If you do your own C-64 programming, you might also be interested in the Epyx Programmers' BASIC Toolkit™. This is a comprehensive programmer's utility package that boasts "assembly language graphics with BASIC convenience." It adds about 100 new commands to Commodore's resident BASIC, including major operating system enhancements, such as a complete disk I/O upgrade. This I/O upgrade features a directory listing command, terse disk command syntax, and

LOAD/SAVE for graphics, sprites, and character sets. The Epyx Programmers' BASIC Toolkit's advanced utilities include graphics tablet drivers and printer commands that help you develop professional-quality application programs for database processing and business graphics. In addition, the Epyx Toolkit has very complete interactive sprite and font editors that help to make it a "super" game design tool.

Both of these new Epyx products are modestly priced and are widely available discounted for under \$30 each. For more information on them, contact Epyx, Inc., 1043 Kiel Court, Sunnyvale, CA 94089.

## Wrapping It Up

That does it for this month. Here we've looked at hamshack computer care and maintenance. We've also reached out for some interesting books for the hamshack and examined some new software offerings. Next time we'll wrap up the computer series with a close look at computer software for the amateur radio operator. See you then.

73, Karl, W8FX

# GRAYLINE CHART FOR W8FX

DATE: 7 4 1986

COORDINATES = 32.48 / 86.3 (MILLBROOK AL)

LOCAL SUNRISE = 10:47 (GMT)

LOCAL SUNSET = 00:52 (GMT)

## AT YOUR SUNRISE...

GMT	PREF	QTH
10:42 (RISE)	ZP	PARAGUAY
10:44 (SET)	VK9X	CHRISTMAS IS.
10:46 (SET)	YB/YC	INDONESIA
10:46 (RISE)	WO	MO (ST. LOUIS.)
10:47 (RISE)	W4	AL
10:48 (SET)	VK0	HEARD IS.
10:51 (RISE)	WO	IA
10:51 (RISE)	CO	CUBA
10:51 (RISE)	HKO	BAJO NUEVO
10:52 (SET)	1S	SPRATLY
10:52 (RISE)	HK	COLUMBIA
10:52 (SET)	HL/HM	KOREA

## AT YOUR SUNSET...

GMT	PREF	QTH
00:47 (SET)	W3	PA (PITTSBURGH)
00:47 (SET)	W4	GA
00:51 (SET)	W8	WV
00:51 (RISE)	AP	PAKISTAN
00:51 (SET)	W4	TN (KNOXVILLE)
00:52 (SET)	W4	AL
00:52 (SET)	W2	NY (BUFFALO)
00:55 (RISE)	UHB	TURKOMAN
00:56 (RISE)	UA1	USSR (LENINGRAD) EUR

Fig. 3—DX Tool Kit grayline chart. Shown above is a typical grayline chart as produced by the DX Tool Kit program. It shows sample sunrise and sunset targets from the author's Alabama QTH. Program is available from the Ham Data Co.



# Contest Calendar

a monthly feature by  
FRANK ANZALONE, W1WY

## NEWS/VIEWS OF ON-THE-AIR COMPETITION

**W**e are still holding several plaques won in the 1984 World-Wide Contests due to a lack of shipping information from the winners. If you are in that group contact me directly. This does not apply to the 1985 winners announced in the September and the October issues of CQ.

The Calendar of Events for the beginning months of 1987 threatens to become somewhat confusing. The last day of January and February falling on a Saturday and the first day of the following month falling on a Sunday makes for a confusing situation. This therefore does not qualify as the first FULL weekend of that particular month. Are you confused? So were many of the organizers who in the past have scheduled their activities on a full weekend of the month. Hopefully, some of these overlapping dates will be finalized in time for me to give a more detailed explanation next month.

Received in time for this month's column is an announcement from Jarma, OH2KI, that he expects to be active from Gibraltar in this year's WW CW Contest. The call had not been issued as of this writing, but it probably will be a /ZB2 like it was last year.

Too late for last month's issue was a letter from Bob, KH9AC, requesting information about our phone contest in October. Rules and log forms were sent to Bob, so hopefully we will be hearing some activity from Wake Island.

The above information has been forwarded to most of the prominent DX bulletins, so the deserving will be informed before the dates of the contests.

Deadline for material for the February issue is November 15th, and December 15th for the March issue. My home address is where it should be sent.

73 for this time, Frank, W1WY

### ALARA YL/OM Contest

0001Z to 2359Z Saturday, November 8

Organized by the Australian Ladies Amateur Assn., this activity is open to all YLs, OMs, and SWLs worldwide. YLs work everyone, OMs work YLs only, and SWLs log YLs only.

Use all five bands, 3.5 through 28 MHz. Each station may be worked on each band and each mode for point credit.

**Exchange:** RS(T), QSO no. starting with 001, and name. (ALARA members will identify.)

**Scoring:** Phone—ALARA contacts 5

14 Sherwood Road, Stamford, CT 06905

### Calendar of Events

* Oct.	25-26	CQ WW DX Phone Contest
* Oct.	29-31	YLRL Anniv. SSB Party
* Nov.	1-2	Int. Police Assoc. Contest
* Nov.	1-3	ARRL CW Sweepstakes
Nov.	8	ALARA YL/OM Contest
Nov.	8-9	European RTTY Contest
Nov.	8-9	Czechoslovakian DX
Nov.	15-16	AOEC 160 Meter Contest
Nov.	15-16	Oceania QRP CW Contest
Nov.	15-17	ARRL Phone Sweepstakes
Nov.	29-30	CQ WW DX CW Contest
Dec.	5-7	ARRL 160 Meter CW
Dec.	6-7	Telco. Pioneers QSO Party
Dec.	13-14	ARRL 10 Meter Contest
Jn.1-	Dc.31	UBA SWL Competition
Jan.	17-18	Crazy 8's HF VHF UHF
Jan.	23-25	CQ WW 160 Meter CW Contest
Jn.31	-Fb.1	YL ISSB CW Contest
Feb.	7-8	QCWA CW QSO Party
Feb.	14-16	YLRL YL-OM Phone Contest
Feb.	20-22	CQ WW 160 Meter SSB Contest
Feb.	21-22	ARRL DX CW Contest
Feb.	21-22	YL ISSB Phone Contest
Fb.28	-Mr.2	YLRL YL-OM CW Contest
Mar.	7-8	ARRL DX Phone Contest
Mar.	7-8	QCWA Phone QSO Party
Mar.	28-29	CQ WW WPX SSB Contest

\* Covered last month.

points, non-member YL contacts 4 points, OM contacts 3 points.

CW—Double above points for CW contacts.

SWL—5 points for ALARA contacts logged, 4 points for non-member YL stations logged.

**Frequencies:** CW—28150, 21150, 14055, 7015, 3530. Phone—28500, 21190, 21360, 14190, 14290, 7110, 3580 (plus or minus). (A poor choice of 7. and 3.5 frequencies on phone for USA participation—ed.)

**Awards:** A wide selection of certificates to YL, OM, and SWL winners in each country, continent, VK call area, and overall score. The Florence McKenzie CW Trophy to the top-scoring VK YL Novice operator.

Logs must be received by December 31st by the ALARA Contest Manager, 31 Cadell Street, Wentworth 2648, N.S.W. Australia.

### Czechoslovakian Contest

1200Z Sat. to 1200Z Sun., Nov. 8-9

There have been no changes in the format of this year's OK-DX Contest. It still remains a world-wide-type contest, however, so do not limit your activity to working OK's only.

Use all six bands, 1.8 to 28 MHz. The same station may be worked once per band, either phone or CW, for QSO and multiplier credit.

**Classes:** Single operator, both single and all band, multi-operator all band only, and SWL. (Club stations will be considered multi-operator.)

Only one transmitter and one band permitted during the same 10-minute period, no QSYing to another band.

**Exchange:** RS(T) and number of your ITU zone.

**Scoring:** One point per QSO; 3 points if it's with a Czech (OK4/mm 1 point only). Own country may be worked, but for multiplier credit only.

**Multiplier:** Sum of different ITU zones worked on each band.

**Final Score:** Total QSO points from all bands times the sum of the zone multipliers from each band.

A penalty of three additional contacts of the same point value will be deducted for each duplicate QSO or multiplier removed by the committee. Taking credit for excessive duplicates and other violations (regulations, unsportsmanlike conduct, etc.) will be deemed cause for disqualification.

**Awards:** Certificates in each class to the top-scoring station in each country. Additional awards will be made if returns justify. The "100 OK," "OK SSB," "Slovensko," and other Czech awards will be issued for contacts in the contest if a written application is submitted with your log.

Use a separate log for each band, indicate the zone multiplier only the first time it is worked on each band, and include a cross-check list for each band with 200 or more QSO's.

A summary sheet showing the scoring and the usual signed declaration that all rules have been observed is also requested.

All entries must be postmarked no later than December 15th and go to: Central Radio Club, P.O. Box 69, 113 27 PRAHA 1, Czechoslovakia.

### DARC WAE RTTY Contest

0000Z Sat. to 2400Z Sun., Nov. 8-9

Rules for the WAEDC RTTY Contest are the same as for the European c.w. and phone contests held in August and September. Complete rules were in the August issue, and since they are quite long, they will not be repeated here.

There is one main difference, however. In the RTTY contest, exchanges are not limited to between Europeans and



## 1985 OK Contest Results

### U.S.A.

W0WP	AB	20,440
K2SX	"	6,944
W3ARK	"	6,096
N4MM	"	396
WK4F	"	102
W5FO	14	14,906
K9CLO	"	5,150
AC8W	"	3,975
W9OA	"	3,516
KA1LZR	"	1,668
N4HB	"	1,208
K3RXK	"	522
W1OPJ	"	240
K4XO	"	175
WB4TDH	"	1,824

### Canada

VG1ASJ	AB	13,790
CH1AW	"	5,525
VG3XN	14	6,525

non-Europeans. Contacts between stations in other continents as well as one's own continent are also permitted, but not between stations in the same country.

The multiplier is counted according to the ARRL and the WAE country list. In addition, each call area in JA, PY, VE/VO, VK, W/K, ZL, ZS, and UA9-0 will also be considered as a multiplier.

The multiplier point per band is the same as shown for the c.w. and phone contests, except for countries within one's own continent. These are counted as one per band only, regardless of the band.

Certificates will be awarded to the winners in each class and each country. Continental leaders will be awarded the WAEDC plaque.

It is suggested that you use the official DARC log forms. A large SASE (IRC's) to the address below will get you a supply.

Mailing deadline for logs is December 15th and they go to: WAEDC Contest Committee, P.O. Box 1328, D-8950 Kaufbeuren, West Germany.

## AOEC 160 Meter CW Contest

1800Z Sat. to 0700Z Sun., Nov. 15-16

Sponsored by the OVSF of Austria, this is a worldwide contest, so you are not limited to working OE only. However, you earn extra multiplier credit for working different Austrian areas. Operation is limited to single operators, and there is an SWL division.

The OE's are permitted to operate from 1810 to 1950 kHz and probably generate a lot of European activity, making it attractive for overseas participation.

**Exchange:** RST and QSO number starting with 001. OE's will include their District Locator number.

**Scoring:** One point per QSO.

**Multiplier:** (A) Each of the 9 Austrian call areas worked are worth 2 points. (B) Each Austrian Locator District counts 1 point. (C) Each prefix worked counts 1 point. (*I assume they mean from other countries—ed.*)

**Final Score:** Total QSOs times the sum of the multiplier points. SWLs use the same scoring system.

**Awards:** Certificates will be issued to the 10 top-scoring entries from each continent.

There is a 5-point penalty for each unmarked duplicate contact for which credit has been taken.

The usual signed declaration that all rules and regulations have been observed is requested.

Mailing deadline for logs is December 31st, and they go to: OVSF AOEC 160 Meter Contest, Theresiengasse 11, A - 1180 Vienna, Austria.

## Oceania QRP CW Contest

0000Z Sat. to 2400Z Sun., Nov. 15-16

The CW Operators QRP Club of Australia is behind this one. Their motto: "We do more with less."

Use all six bands, 1.8-28 MHz (no WARC). You can operate the full 48 hours or any 24 consecutive hours in the 48-hour contest period.

**Classes:** QRP—Single operator and multi-operator, both single and all band. QRO—Single operator, single and all band. SWL—Single and all band.

**Exchange:** RST plus QSO number starting with 001.

**Scoring:** For QRP stations (5 watts or less):

Up to 1 watt	6 points
1 to 2 watts	5 points
2 to 3 watts	4 points
3 to 4 watts	3 points
4 to 5 watts	2 points

For QRO stations (over 5 watts) QRO to QRP contacts, 1 point.

SWL—1 point for each QRO station logged; 3 points for each QRP station logged.

**Multiplier:** Every contact in a different ITU Zone counts as a multiplier on each band.

**Bonus:** Field stations can multiply their total score by 2.

**Final Score:** Total QSO points from all bands × total multiplier from all bands × bonus if any. (The same station can be worked once per band in each 24-hour period.)

**Awards:** Certificates in each class for single and multi-operators and SWL (minimum of 10 contacts).

Use a separate log sheet for each band and a summary sheet showing the scoring and other essential information, and the usual signed declaration.

Entries must be received no later than December 29th by the Contest Manager,

Len O'Donnell, 33 Lucas Street, Richmond, S.A. 5033, Australia.

## CQ WW DX CW Contest

0000Z Sat. to 2400Z Sun., Nov. 29-30

Just a reminder, as if you needed one, that the CW section of our WW DX Contest is coming up the last weekend of this month. The phone section of course is past history. Complete rules were published in the September issue. There are no changes from those used in previous years, as they are well established worldwide. The contest trophies list has been updated and well covered in the rules.

All logs, both Phone and CW, must be sent to the CQ office: CQ World-Wide DX Contest, 76 North Broadway, Hicksville, NY 11801 USA.

Deadline for logs for the Phone section is December 1st, and January 15th for the CW section coming up. Be sure to indicate Phone or CW on your envelope. This will avoid your log from being entered in the wrong section.

## ARRL 160 Meter CW Contest

2200Z Fri. to 1600Z Sun, Dec. 5-7

This is the 17th year for this top-band activity. Exchanges will be between stateside and VE and DX stations. DX to DX contacts, however, are not permitted.

**Classes:** Single operator and multi-operator.

**Exchange:** RST and your ARRL section; country for DX and ITU region for maritime mobiles.

**Scoring:** Contacts between stations in ARRL sections count 2 points, with DX stations 5 points.

**Multiplier:** Determined by the number of ARRL sections plus VE8/VY1 (maximum of 74) and DX countries worked (for W/VE participants). (DX use ARRL sections only.)

**Final Score:** Total QSO points times the ARRL section and DX multiplier.

**Awards:** Certificates to the top-scoring single operator station in each section and DX country, and to the top-scoring multi-operator station in each ARRL division and continent.

The ARRL 160 band plan requires that W/VE stations transmit only in the 1800-1825 and 1830-1850 kHz segments, keeping the "DX Window" (1825-1830 kHz) clear for DX stations. They will indicate where they will be listening for cross-frequency contacts.

The usual grounds for disqualification—violation of rules, excessive duplicate contacts, etc.—will prevail.

Logs with more than 200 QSOs must include dupe sheets. A large SASE to the ARRL will get you the necessary forms to make log keeping easier.

All entries must be postmarked no lat-



er than January 4th and go to: ARRL Communications Dept., 160 Contest, 225 Main Street, Newington, CT 06111.

## Telco. Pioneers QSO Party

1900Z Sat. to 0500Z Mon., Dec. 6-8

This is the 22nd annual QSO party of the Telephone Pioneers of America, and the 9th year it is sponsored by the John D. Burlie Chapter #89.

Members may be worked on each band and each mode if they are in different chapters, but only one contact is permitted between stations in the same chapter.

**Exchange:** QSO number and chapter number.

**Scoring:** One point per QSO on each band and each mode, and one multiplier for each different chapter worked. There are 100 TPA and 15 USTPA chapters.

**Frequencies:** Tune up the band from the following. CW—1800, 3555, 7028, 14055, 21055, 28055, 5010 MHz. Novice—3725, 7125, 21125, 28125. RTTY—3630, 7100, 14100, 21100, 28100. Phone—1870, 3815, 3915, 7255, 14265, 21355, 28685, 5010, 144, 220.10 MHz. Contacts via simplex or repeater are valid.

**Awards:** There is a wide selection of certificates for Life Members, Active Members, and Pioneers. Chapters in Canada have an awards program, and also the Burlie Chapter #89 is offering awards.

It is suggested that members who have not received this announcement from their chapters write to Ted Phelps for additional detailed information.

Mailing deadline for all entries is January 15th to: Ted Phelps, W8TP, c/o John D. Burlie chapter #89, Telephone Pioneers of America, 6200 East Broad Street, Columbus, OH 43213.

## ARRL 10 Meter Contest

0000Z Sat. to 2400Z Sun., Dec. 13-14

This is the 14th annual 10 Meter Contest organized by the ARRL.

It's a worldwide activity in which DX stations are permitted to work other DX stations. You are not limited to working W/K's and VE's only.

The same station may be worked once on phone and again on CW; no cross-mode, however. A maximum of 36 hours operating time is permitted out of the 48-hour contest period for all stations.

**Categories:** Single operator, mixed

mode, phone only or CW only. Multi-operator mixed mode only.

**Exchange:** W/VE stations (including KH6 and KL7) send RS(T) and state or province. DX stations (including KH2, KP4, etc.) send RS(T) and QSO number starting with 001. Maritime mobiles send RS(T) and ITU region. Novice and Tech. stations must identify /N or /T.

**Scoring:** Phone QSOs are worth 2 points, CW 4 points, and Novice 8 points.

**Multiplier:** Fifty U.S. states, VE call areas, DX countries, and ITU regions.

**Final Score:** Total QSO points times the state, province, DX country, and ITU region multiplier.

**Awards:** Certificates to the top single operator in each category for each ARRL section and DX country, and to the top multi-operator station in each ARRL division and each continent.

Indicate the multiplier only the first time it is worked. Dupe sheets are required for logs with 500 or more QSO's. The usual disqualification criteria will be observed. A large SASE will get you log and instruction forms. Mailing deadline for all entries is January 18th to: ARRL Communications Dept., 10 Meter Contest, 225 Main Street, Newington, CT 06111.

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See September 1984 issue of 73 for TIMEX/RTTY article

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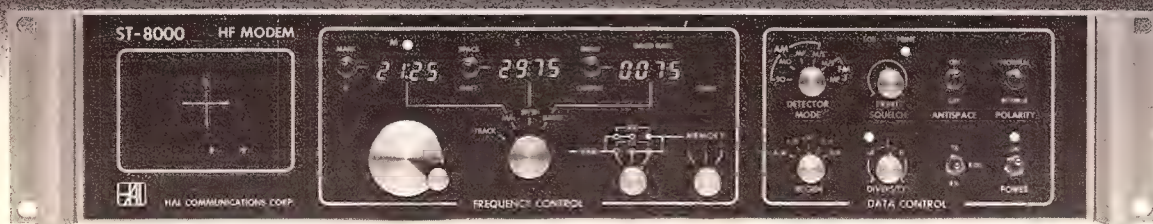
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## NEWS OF COMMUNICATION AROUND THE WORLD

*And if I worked them Wednesday,  
Well, what is that to you?  
I'll work 'em again on Thursday,  
Just to show I'm getting through . . .*

**M**ost DXers want to be members of the inner circle—those in the know who pass the confidential DX information to the other anointed ones at meetings, who know and accept everywhere the true-blue DXer as one of them, an equal and the very finest of amateurs. And this is something that often puzzles a newly minted DX type. They come asking the question, "When will I be considered a true-blue DXer?" The question is one of the Eternal Enigmas of DXing. Eventually most learn that if you know the answer, you need not ask the question. Last week one of the Locals came up around the curve of the hill on a cool late-October morning. He came with the question.

"Why is it," the Local asked, perhaps the sharp note of plaintiveness in his voice, "that while I've been DXing for some years now, a top club scorer in many of the CQ World-Wide DX Tests and with a good total of DX countries, that I sometimes feel that I am still on the outside looking in? Am I doing something wrong?"

Possibly some of the more sensitive type DXers have also asked this question. Sometimes one hesitates to ask aloud such questions; one might be apprehensive about the answer. But it has often been noted that much of the club action, even the meeting attendance, and most of the activity comes from the newest members. These are the ones who till the DX vineyards, hold the club offices, do the club chores, and usually are the most active in DXing. Possibly there will be some leavening in such activities from some participation by the older members, but frequently it does seem that the longer the membership, the less the participation. Some may for years avoid attending even a club meeting, but when they do show, let there be no doubt. This is their turf and they come to be heard and to influence. Should one of the newer members, and newer is used in a relative sense, seek to circumvent the sacred rule of longevity, he will be named in whispered asides as an upstart, a parvenu, and one not yet acquainted with the DXer's Code. But we thought that everyone knew this, and wondered why the question had to be asked. Things always appear so simple when one understands.

77 Coleman Dr., San Rafael, CA 94901



*When one works 160, one concentrates. Here in deep concentration is Rudolf Klos, DK7PE, when he was operating XX9CW at Macau earlier this year. Rudi operated from Taipai Island in Macau this spring and reports that not only are there high mountains to the NE and NW to block the paths to Europe and to the States, but local QRM in downtown Macau took out anything but full-bore signals. Rudi found solace and 1700 QSOs from Taipai Island—109 on 160, 715 on 80, and 846 on 40. If you worked XX9CW, QSL to DK7PE.*

Yet understanding can sometimes be difficult. We still remember the time when, in a conversation with a notable DXer, we sought to expand our understanding of why such acceptance levels exist. Maybe we then ended up more confused than ever.

"Ah, it is the mystique of DX that you seek to fathom," this one had immediately advised us, immensely adding to our store of unenlightenment. "Learn the mystique of DXing and you will understand everything. Everything!" And that was all that was said. One can appreciate how enlightened we were after hearing this. It did seem that there are some who know and understand the mystique. Why didn't we?

It was enough even back then for us to climb up the hill in our bewilderment and ask the question of the Old Timer. There we got a short grip on a slippery topic, the Old Timer brusquely advising us: "You're at the state where you think you know all the answers but have yet to understand the questions." And with this Local still on our hands, we had to think of those other days and the questions then asked. Along the way we like to think that we may have come to understand, at least partially, some of those DX Mysteries of the Ages. But how does one lift the veil for one who does not even yet understand the key-stone of all DX knowledge: "DX IS!"

"We can understand your concern," we said compassionately, "for most DXers have trod the same path that you have. You ask, 'Why is it when I am so

worthy and deserving that I feel neglected?' That's the problem, isn't it?" we asked, and the Local nodded. "Sort of," he admitted, and we knew we were on the right track. This one wanted to be recognized.

"It has been said before," we started in, knowing that the whole explanation might not be understood, "that each generation makes its own good days. And when you have participated in efforts with others, known the same trials and triumphs, there is a feeling that comes that is always good to recall. When you meet one of those from the golden days of the past, you warmly welcome him. He is a person to be respected and honored, even as you yourself merit such honor. But if you are one who did not know those other days, whose knowledge is comparatively recent, say the last 15 to 25 years, then you might not understand. And when you do not understand, you are not ready to enter the inner circle, to know the Mysteries of the Ages or be capable of understanding the Eternal Enigmas of DXing. You know but you don't know. And thus you do not understand." We leaned close to the Local to hold and note his attention. "Understand?" we asked. He did not.

If he had, we would have been surprised. The puzzlement in his eyes was its own answer to our question. But if one stops to recall the pleasure in meeting a former classmate, absent over the long years since, one will remember the warm words and the good feeling. It is the same in DXing. All of these are ties to the good times and good memories of the past, not to mention the good DXing. It was together you fought the good fight, knew the big DXpeditions, and they were part of your DX world, the best there ever will be. But that's the way it has always been. But it was not yet enough for the Local.

"What you are saying," he growled with some feeling, "is that the only thing in DXing that counts is age in grade. That all one has to do is to survive and attend all the DX meetings and eventually one becomes acceptable—acceptable only because one is a durable Ancient. What about DXCC totals, the Honor Roll, contest trophies, and things like that? Don't they count at all?"

Of course they count. Those who attain such things should always be noted and honored—always, but in proportion to their need and station. And always one must remember that accomplishment alone does not bring understanding. One will gain understanding when one is ready. This cannot be rushed. And much of the DXing by a newly minted type is preparation for the understanding.



## The WPX Program Mixed

1229 ..... N4KE 1231 ..... K1BAZ/DV1  
1230 ..... VE7FUE

### S.S.B.

1832 ..... N4KE 1836 ..... YB8QD  
1833 ..... XE1AFQ 1837 ..... N6HYK  
1834 ..... EA5AEN 1838 ..... IT9KHB  
1835 ..... EA8TE 1839 ..... IK4DSM

### CW

2391 ..... N4KE 2394 ..... K0OST  
2392 ..... NN5G 2395 ..... EA7AZA  
2393 ..... F6ENU 2396 ..... K1BAZ/DV1

### Endorsements

Mixed: 450 N4KE, K1BAZ/DV1. 500 N4KE, K1BAZ/DV1. 550 N4KE, W9IAL. 600 N4KE. 650 N4KE. 700 N4KE. 750 N4KE. 800 N4KE. 900 N4KE. 950 N4KE. VE3UR. 1000 K9UQN. N4KE. 1050 K9UQN. N4KE. 1100 N4KE. 1350 W1BWS. 1400 EA9IE. W1BWS. 1450 W1BWS. 1500 W1BWS. 1550 W1BWS. 1600 W1BWS. 1700 I2PJA. 1750 I2PJA. 1800 I2PJA. 1850 I2PJA.

S.S.B.: 350 N4KE, EA5AEH, EA8TE. 400 N4KE, EA5AEN, EA8TE. 450 N4KE, EA8TE. 500 N4KE, EA8TE. 550 N4KE. 600 N4KE. 650 N4KE. 700 N4KE, I6GAS, K8ZZU. 750 N4KE, I6GAS. 800 N4KE. 950 DF7QD. 1000 W4UW. 1150 PY4VX. 1250 PY4VX. 1400 EA9IE. 1450 WA4QMQ. 1700 I2PJA. 1750 I2PJA. 1800 I2PJA. 1850 I2PJA.

C.W.: 350 N4KE, K0OST, EA7AZA, K1BAZ/DV1. 400 N4KE, K0OST, EA7AZA, K1BAZ/DV1. 450 N4KE, EA7AZA, K1BAZ/DV1. 500 N4KE, EA7AZA. 550 N4KE, DL3GK, EA7AZA, VK5AGX. 600 N4KE, KA1CLV, EA7AZA, VK5AGX, PY2RRG. 700 VE4AEX, EA7AZA, PY2RRG. 750 VE4AEX, EA7AZA, WA4QMQ. 800 EA7AZA. 850 EA7AZA. 900 K9UQN, I7PXV, EA7AZA. 950 I7PXV. 1000 W1OPJ, I7PXV. 1100 PA0SNG. 1150 PA0SNG. 1200 PA0SNG. 1250 PA0SNG. 1300 PA0SNG.

10 meters: N4KE, G4CHP, W4UW, PP2ZDD.  
15 meters: N4KE, G4CHP, KA1CLV, PP2ZDD, K1BAZ/DV1.  
20 meters: N4KE, G4CHP, KA1CLV, PP2ZDD, K1BAZ/DV1.  
40 meters: N4KE, W3ARK, PP2ZDD.  
80 meters: N4KE, N2CIC, PP2ZDD.  
160 meters: N4KE, IV3PVD.

Asia: N4KE, W3ARK.  
Africa: N4KE, G4CHP.  
No. America: N4KE, N2CIC, N12N, N0OST, EA7AZA.  
So America: N4KE, W3ARK.  
Europe: N4KE, W9IAL, EA7AZA, IK4OSM.  
Oceania: N4KE, G4CHP.

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**Award of Excellence Holders:** ON4QX, YU2DX, OK3EA, OK1MP, N4NO, ZL3GQ, W4BQY, I8JX, WA1JMP, K0JN, W4VQ, KF2O, W8CNL, W1JR, F9RM, W5UR, CT1FL, W8RSW, WA4QMQ, W8ILC, VE7DP, K9BG, W1BWS, G4BUE, N3ED, LU3YLW4, NN4Q, KA3A, VE7WJ, VE7IG, N2AC, W9NUF, N4NX, SM0DJZ, DK5AD, W9JIC, W3ARK, LA7JO, VK4SS, K6JG, N4MM, I8YRK, W4CRW, SM0AJU, K5UR, K6XP, N5TV, K2VV, VE3XN, W6OUL, DL1MD, DJ7CX, DL3RK, WB4SIJ, SM6DHU, N4KE, I2UIY, DL7AA.

**Award of Excellence Holders with 160 Meter Endorsement:** W1BWS, G4BUE, LU3YLW4, VE7WJ, W9NUF, N4NX, SM0DJZ, DK5AD, W3ARK, LA7JO, W4VQ, K6JG, W4CRW, N4MM, SM0AJU, KF2O, K5UR, OK1MP, N5TV, W8CNL, W1JR, W6OUL, W4BQY, W5UR, N4NO, W8RSW, N4KE, I2UIY, W8ILC.

Complete rules and application forms may be obtained by sending a business-size, self-addressed, stamped envelope (foreign stations send extra postage if air-mail desired) to CQ WPX Awards, P.O. Box 1351, Torrance, CA 90505-0351 U.S.A.

We had to start thinking that perhaps we had not explained things in a manner which the Local could understand. At times we feel it is akin to answering the repetitive "Why?" of a small child. You explain and it should be easy to understand, but the questions persist. Then the Local broke in with another question.



Here is a picture of Molly Henderson, whom many DXers will recall as ZE1JE at Salisbury in Rhodesia. Still at the same QTH but now signing Z21JE in Zimbabwe, Molly greets a lot of visiting DX types. The pair standing behind Molly seem somewhat familiar. Possibly some DX types will recognize them. They do have the bright look, the happy smiles, and the good feeling that all DXers have, some possibly more than they can stand.

"And what about this 'DX IS!' you mentioned?" he asked. "Just what does that mean and why is it so important?" And continuing without hardly pausing for breath, the Local pressed on. "Isn't there any way to speed up things?"

Maybe there is. But one does not speed up the days by moving the hands of a clock. One has to change the scenario of the days. "You can get early recognition as a DXer," we advised, "and some you may remember have done it. But it is not easy. Have you ever considered going on a DXpedition? Find a rare place and you will have thousands of instant friends. Thousands! What do you think of that?"

It was a good move. The Local immediately changed his direction of anxiety. "A DXpedition?" he echoed. "Where do you think I might go? The Caribbean? The South Pacific? Africa? What would be good? It sounds interesting and a good thing to think about."

Having brought the Local this far, we thought that we had served him well and he could make his own decisions. "Just get some of the most-needed lists out of the DX Bulletins and you will have a good idea of where to go. But you might keep in mind Albania or Burma. Or Libya or Bhutan. Maybe even Peter I Island now that it is turning spring down that way. You put a couple of these on the air and fill a couple of log books with QSOs and you will be remembered. Definitely!"

Now you know, and we know that putting any one of these on the air would entail a tremendous effort... or a lot of luck. But have you ever worked a really rare one where you did not remember permanently the name and call of the operator? Always you are anxious to meet such a good and deserving celebrity face to face, to shake his hand and to ensure that he remembers working you from that dis-

## The WAZ Program

### 10 Meter Phone

308 ..... AB9O

### 15 Meter Phone

236 ..... AB9O

### 20 Meter Phone

569 ..... N4OM 572 ..... KA0NNF  
570 ..... JA5BEN 573 ..... IK8EPC  
571 ..... W6FAH

### 80 Meter Phone

38 ..... AB9O

### 40 Meter CW

58 ..... DK5AD

### All Band WAZ SSB

3041 ..... K8MID 3047 ..... DL1BS  
3042 ..... YB3CDL 3048 ..... DJ9FK  
3043 ..... JA3AYX 3049 ..... I6ONE  
3044 ..... JA7XRO 3050 ..... WA0GUD  
3045 ..... N8BLD 3051 ..... SP3CB  
3046 ..... DL4FW

### Phone and CW

5987 ..... I1JQJ 5991 ..... JA3VZD  
5988 ..... SP5HHV 5992 ..... JA9CWJ  
5989 ..... JA1IHE 5993 ..... DL8ZAW  
5990 ..... G3YEC 5994 ..... KG9Z

Applications and reprints of the latest rules may be obtained by sending a self-addressed stamped envelope (39 cents) size 4 1/2 x 9 1/2 to the WAZ Manager, Leo Haisman, W4KA, 1044 S.E. 43 Street, Cape Coral, Florida 33904. Applicants forwarding QSL cards either direct to the WAZ manager or to a check point should include sufficient postage for safe return of their QSL cards. The processing fee for all C.Q. awards is \$4.00 for subscribers and \$10 for non-subscribers. In order to qualify for the subscriber rate, please enclose your latest CQ mailing label with your application.

tant spot that counts. And always they seem to remember. "Let's see. I remember your good signal. Gave you a five and nine report, didn't I?" Of course it was, and if not a five by nine, then it certainly was a five nine niner. Always!

By this time we were getting the feeling that the Local was losing some of the frustration at the lack of recognition that he felt was due him. Then the Old Timer came by and things started to slip back downhill again. Of course, the Local had to again voice all his questions just as though he had not just now received a clear and enlightening explanation. However, the Old Timer took a lot less time to set the thinking straight.

"You go to the club meetings," he charged the Local, "and always with whom do I see you talking? It is always those fellows who came into the club about the same time you did. And if not them, you will be trying to improve your standing with the older club members. Have you ever thought of talking with the newer club members and making them welcome and comfortable with a bit of attention? And are you not doing just the same thing that you complain about to those who have come on the scene after you?" The Local had to admit that maybe this was a line of thinking that he had not given much attention.



## 5 Band WAZ

Standings as of August 1, 1986

All 200 zones worked:

1. ON4UN	43. I4EAT	85. LZ1NG
2. K4MQG	44. ZL1BQD	86. N4JF
3. SM4CAN	45. TG9NX	87. CT2AK
4. AA6AA	46. XE1J	88. HB9CIP
5. W8AH	47. F5VU	89. OK1MG
6. W6KUT	48. W3AP	90. CT4BD
7. EA8AK	49. YO3AC	91. VK6HD
8. LA7JO	50. K3TW	92. EA6ET
9. EA3SF	51. XE1OX	93. VK3QI
10. OH1XX	52. VE7IG	94. LZ2DF
11. EA8OZ	53. OK1ADM	95. ON4QX
12. W0SD	54. CT1FL	96. SM0DJZ
13. K0ZZ	55. WA1AER	97. CT3BM
14. ON6OS	56. N4RR	98. K2TQC
15. OK3TCA	57. UW0MF	99. EA8XS
16. K6SSS	58. W4DR	100. HA9RE
17. ZL3GQ	59. OK1MP	101. SM4CTT
18. OK3CGP	60. W1NW	102. A71AD
19. SM0AJU	61. OE1ZJ	103. LZ2CC
20. OZ3PZ	62. HB9AHL	104. SM4CLE
21. I3MAU	63. HB9AMO	105. LZ1HA
22. I2ZGC	64. LA6OT	106. SM5AKT
23. 4Z4DX	65. UR2QD	107. CT4NH
24. N4KE	66. UK2RDX	108. ZL4BO
25. K5UR	67. ZS5LB	109. I1BSN
26. K9AJ	68. F6DZU	110. DF6CY
27. SM3EVR	69. DL4YAH	111. DK5AD
28. LA5YJ	70. LA7ZO	112. DL6EN
29. DL3RK	71. W9ZR	113. SM6CVX
30. N4WJ	72. W1NG	114. LU8DPM
31. G3MCS	73. VK9NS	115. SM6DYK
32. SM5AQD	74. N4KG	116. DL7XS
33. W0MLY	75. YU7DX	117. DF7NM
34. I0RIZ	76. DL8MAG	118. UA3TT
35. ON5NT	77. OK3DG	119. OK1DD5
36. OH6JW	78. ZL1BOQ	120. YU2TW
37. OK1AWZ	79. EA9IE	121. EA8QL
38. IV3PRK	80. DL7HZ	122. I1APQ
39. DJ6RX	81. DJ9RQ	123. G3TJW
40. OH3YI	82. EA5SP	124. NW5K
41. I4RYC	83. EA2IA	125. AB9O
42. ZL1BIL	84. SP3BQD	

The top 16 contenders for 5 Band WAZ are:

1. JA1BWA, 199	9. K4CEB, 199
2. JA3EWU, 199	10. G3GIQ, 199
3. N4WW, 199	11. SP6KTE, 199
4. K5YRA, 199	12. ZP5JCY, 199
5. W8UVZ, 199	13. LU6GV, 198
6. F6BEE, 199	14. W2YY, 198
7. JA0CWZ, 199	15. K7UR, 198
8. W6GO, 199	16. W3GG, 198

381 Stations have attained the 150 zone level.

"As for 'DX IS,'" the Old Timer roared on, "we've been hearing that said for years, and most DXers will assure you that while they understand just what it means, they would appreciate having it made just a bit clearer for them. When you understand that, you will understand everything. But it does seem that you have yet a ways to go to attain understanding. Quite a ways." We could see the Local's brow furrowing as he considered these words, but the Old Timer was not finished.

"And if you want to be recognized as one of the foundation rocks of the DX club," he continued, "just take care of your health and stick around. In the club,



This is the club station of the Amateur Radio Association of Bahrain (ARAB) with Mike Bowman, A92MB, standing in the doorway. Mike was in Bahrain for several years, but has returned to England. Rudi Klos, DK7PE, caught Mike at A92C while Mike was there on a business trip and Rudi was headed home from his XX9CW effort at Macau. Mike was working on a 160 antenna for A92C and, you might be hearing that station on the low band. (DK7PE photo)

as in many other places in life, you gain status and recognition, not to mention just simple appreciation by your peers, just by getting in early and outliving most everyone else. You should try it."

Son of a gun. The Old Timer was gunning in all directions. But we were thinking that he was right. And no mention had even been made of the idea of a big DXpedition by the Local to Albania or Bhutan, or maybe even to Kentzell's Island. But all of this was enough for the Local, who was obviously relieved to get some explanations that he could understand, though possibly not much of it did anything to improve his current status. With that he was gone back down to the village.

With the Local gone, the Old Timer sat there with us, he finally noting how the ridges across the way were losing their summer brown and turning green with the first winter rains. But we had to ask about the Local, and the Old Timer just shook his head.

"Nothing changes," he finally said. "All DXers eventually learn how things are, but often the newer DXers have some difficulties. DXers will always admire and accept cleverness, but they will always revere age. But that's the way it has always been, hasn't it?"

We were thinking that the Old Timer was right. At times we have noticed that some of those with whom we fiercely

competed with in other days are showing some wear from the years. Maybe a bit of sagging and bagging here and there, maybe a tendency to find the Silent Key listing and read it first when the magazine arrives. But always they are great DXers and always will be, though maybe they might not be too active these days. And always they will be the salt of the earth! And when we stop to think of it, we cannot even remember hearing one of them in recent years calling "CQ DX" though we also have trouble in remembering hearing them active at all. Maybe age alone will not ensure that a DXer is the true-blue type. But definitely when a DXer stops calling "CQ DX," he might be almost ready.

## Wake Island

Bob Smith, KH9AC, should be heard on everything open from 160 to 10 meters both on CW and SSB. Bob during the summer months was working over the antennas with help from W0ZV and should be heard in both legs of the CQ World-Wide DX Tests.

Previously Bob has signed NH6FU/KH9, but now he has a new callsign. QSLs still go to the same QSL manager, however—WK6T with the usual SASE or SAE/IRC. Depending on his rotating workshift, you will be hearing Bob for the next year of so from Wake. It is realized that for some areas, such as Europe, Wake can be a difficult place to work. Possibly dropping a line to Bob Smith, KH9AC, Box 86, Wake Island 96898 and asking might give some indication what his work schedule is allowing.

## Forty-Year Award

The Northern California DX Club notes that as of October it is 40 years old and will issue a special certificate to mark the anniversary to amateurs outside the continental U.S. who work 40 of the club members. The test period runs from October 10, 1986 to October 10, 1987. There are even hints some prizes will be given to club members who work 40 DX stations in the 10 days after October 10, 1986.

Thus, should you hear some unusual activity coming from the elusive Sixes, you will know the reason. Steve Brunt, WC6I, is handling the burdens for this award. Write directly to him if you covet the award.

## Italian Reciprocal Licensing

I4CMF and I4OCS, Manuel Calero and M. Alessandra Genesini, respectively, recently noted that Italy has reciprocal agreements with a number of countries, San Marino being the latest to sign an agreement. Reciprocal agreements exist between Italy and Austria, Belgium, Canada, Cyprus, Denmark, France, West Germany, Great Britain, Holland, Iceland, Ireland, Luxembourg, Malta, Monaco, Norway, Sweden, Switzerland, the United States, and the latest, San Marino. Should anyone need specific information on reciprocal licensing in Italy, write to the International Amateur Radio Service, Via Giorgione 16, I-40133 Bologna, Italy.

It might be noted that power limits in Italy are 100 watts on 160 and 300 watts on 80 through 10. Actually the 300 watts is good on everything above 80 meters for the General class license; the Limited Class is restricted to





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## CQ DX Honor Roll

The CQ DX Honor Roll recognizes those DXers who have submitted proof of confirmation with 275 or more ACTIVE countries for the mode indicated. The ARRL DXCC Countries List is used as the country standard. Honor Roll listing is automatic when submitting application or endorsement for 275 or more countries. Deleted countries do not count and are dropped from listing as they occur. Total countries are now 316. To remain on the CQ DX Honor Roll, annual updates are required. Honor Roll updates may be made at any time, in any number. Updates indicating "no change" will be accepted to meet the annual requirement. All updates must be accompanied by an SASE for confirmation. The fee for endorsement involving the issuance of a sticker is \$1.00.

### CW

ON4QX	316	W4BQV	312	N4KG	305	W9RY	293	I5XIM	280
W9DWQ	316	W2FXA	312	AB4H	304	K8LJG	292	W2LZX	280
W6PT	316	W6ID	311	W0IZ	303	N5DX	291	W9NUF	280
K4CEB	316	K4XO	311	W8DXA	302	N5FW	291	W6YQ	280
N4JF	316	DL3RK	310	YU2TW	301	I3OBO	290	HB9AFI	279
K9MM	315	AA6AA	309	SM3EVR	300	WA4JTI	290	IT9QDS	279
N4PN	315	DL8CM	309	W6SN	300	W1WLW	289	WA4DAN	278
DL7AA	315	N4MM	308	WB4RUA	300	W4BV	289	DL1QT	277
N6AV	315	W9BW	308	W0SR	300	N8MC	288	G2GM	276
W3GRS	314	K1MEM	308	W7CNL	299	WD9IIC	288	NN4Q	276
W8KPL	314	OK1MP	308	K3FN	298	WA2HZR	286	KA3R	276
K6LEB	314	SM6CST	308	K3UA	298	W0HZ	286	I8WY	276
K6JG	314	W4OEL	307	K9IW	298	K4CX	283	K4SE	275
N6CW	313	W1NG	306	DJ7CX	297	K1VHS	281	N4AH	275
K9AB	313	K9QVB	306	EA2IA	297	JH1VRQ	281	K9W	275
K6EC	312	K8PYD	305	WD9IIX	294	K7ZR	280	K9BWQ	275

### SSB

K2FL	316	W8PCA	313	WA0DCQ	306	JH1VRQ	299	I8KCI	288
W4EEE	316	K5OVC	313	VE3MRS	306	DJ7CX	298	K13L	287
K6WR	316	YU1AB	313	VK3JF	306	K9SM	298	EA3KW	287
W4UG	316	VE7WJ	313	KB5FU	306	I8LEL	298	AB9E	287
W6EUF	316	F2MO	312	EA1OF	305	K8NA	298	W5LLU	287
VE3MR	316	K8PYD	312	NA5W	305	JH4PRU	298	N3ARK	286
DL9OH	316	W6SD	312	KZ8Y	305	K8VFF	298	K4LR	286
N4JF	316	K9RF	312	KB8KW	305	EA9IE	298	N8BJJ	286
I0ZV	316	K4MQG	312	XE1OX	305	XE1NI	298	VE3DLR	286
KD8VM	316	N4MM	312	K3UA	305	HP1JC	297	VE3CYX	285
I0AMU	316	I8ACB	312	XE1J	304	K5DUT	297	KE4HX	285
F9RM	316	W8SS	312	W8IMZ	304	K83OQ	297	K9MNT	285
T12HP	316	N2SS	312	W6SN	304	YU7KV	297	WA2FKF	284
K52I	316	LA7JO	312	VE7HP	304	K3LUE	297	KB5RF	284
YV1KZ	316	OE2EGL	312	W4UNP	304	WB3GPR	296	AG8S	284
I8AA	316	K4XO	312	W6NLG	304	K88EU	296	KD8V	284
W3GRS	315	LU3YL	312	NY5L	304	KQ9W	296	WB3HAZ	283
VE3MJ	315	K6EC	311	I4EAT	304	KB3KV	296	VE3MV	283
4Z4DX	315	W4SSU	311	XE1KS	303	W4BOY	296	IN3ANE	283
W9DWQ	315	I4LCK	311	W2LZX	303	W9OKL	296	AE5B	282
W9JT	315	W6SR	311	KR9O	303	I3OBO	295	CT1UA	282
ZL1AGO	315	K9BWQ	311	WB3DNA	303	K7LAY	295	KC8YM	282
W4NKI	315	K6XP	311	K0GT	303	W0IYR	295	A19R	282
VE2WY	315	K9AB	311	K1MEM	302	KK0C	295	TG9EP	282
K6YRA	315	W1LQG	311	N5FG	302	KA9ABC	295	N1ALR	282
W3AZD	315	W7FP	311	W6FET	302	I8ZTE	294	W6YQ	281
XE1AE	315	N6OC	311	W2FGY	302	NN4Q	294	K9TI	280
VE3GMT	315	OK2BL	310	K9HQM	302	WD0BNC	294	ZL1BQQ	280
ZL3NS	315	IY3YRN	310	WA4DAN	302	I5BDE	294	G4FAM	280
I8YRK	315	AA6AA	310	I8KCI	302	I0SGF	294	VE6PW	280
J9ZB	315	WB3JA	310	K9UAA	302	WD8PUG	294	KB5DN	279
W4DPS	315	DL6KG	310	NJ2C	302	WB3CQN	294	EA6DE	279
I4ZSQ	315	WA4JTI	310	KP4EQF	302	K4SE	293	W9OKL	279
OK1MP	315	N4PN	309	A18M	302	KC8JH	293	JH8NYK	279
ZS6LW	315	K1UO	309	VE3FJE	301	A15I	293	KX5V	279
I8KDB	315	9H4G	309	WB4NDX	301	I1POR	293	K4BYK	279
W9BW	315	W6DN	309	WA3HUP	301	W9NUF	293	I5EFO	278
N4WF	314	W7OM	309	K8CMO	301	WA4LOF	292	VE3IUE	278
OZ3SK	314	ZL1BIL	309	W8ILC/QRPp	301	AC0A	292	KB8O	278
K9MM	314	W1NG	308	W9RY	301	I2MOP	292	K4JLD	277
YV5DFI	314	VK4VC	308	YU2TW	301	VE3FEA	292	WB0UFL	277
K6JG	314	YV5AIP	308	N4CRU	301	VP9CP	292	W4PTT	277
CT1FL	314	N6AV	308	N5FW	301	W8LKG	292	KB0SY	277
OZ5EV	314	W2CC	308	KZ0C	301	XE1OW	292	I8XTX	277
W2SUA	314	A18S	308	N8BKF	301	K1VHS	292	K2JF	277
W0SFU	314	N4KG	308	KE3A	301	W0ULU	292	N7ASL	276
W9YDB	314	K8NA	308	W4OHZ	300	SV1JG	292	WA6DTG	276
OE3WWB	314	WA4WTG	308	I5EFO	300	VE3IPR	291	WA4OPW	276
VE3XN	314	VE4SK	307	K9QVB	300	N5AWS	291	A19U	276
VE1YX	314	WB1DQC	307	KB9KD	300	WB6GFJ	291	KC2RS	276
N7RO	314	I0MBX	307	VE4AT	300	W4JFE	291	WA9IVU	276
K8LJG	314	WD9IIX	307	W24I	300	W6MFC	291	K0HOW	276
W3GG	314	SM4CTT	307	I2ZGC	300	KB0U	291	I8INW	275
I2LLD	314	KV2S	307	WB4UBD	300	K2JLA	291	WB1EAZ	275
K9LKA	313	WDBMGQ	307	KZ2P	300	VE3CKP	290	VE7BSM	275
ON5KL	313	G4CHP	307	W6BCQ	300	KD5ZM	290	K8NWD	275
EA2IA	313	KB9OC	307	WA2MID	300	JA5PUL	289	G3XTT	275
W8LCL	313	KB8DB	307	NW5K	300	W9TA	289	G4GED	275
EA4HL	313	KU9I	307	KA8T	299	K8ZZU	289	VE5FX	275
OZ8BZ	313	K9IW	306	WA0TKJ	299	W4UW	288	KS0Z	275
N6AW	313	N4KE	306	I6PLN	299	OK1AWZ	288	XE1MDX	275

10 watts, and their operating area is from 144 MHz and above, all the way to 250 GHz. How can you tell them?

The General licenses always start with I-K- IS-IT-IV or IX. Some of the smaller islands may have additional combinations. The Limited license always starts with IW, this license not requiring Morse code proficiency.

While we are working this side of the DX street, anyone going overseas and contemplating possible amateur activity should not leave home without talking with Naoki Akiyama, N1CIX/JH1VRQ, at the IARU desk in downtown Newington. Naoki has the answers to your reciprocal and operating questions.

## DXCC—Born Again?

The action by the ARRL Board of Directors at their July meeting in directing the DX Advisory Committee to study the problems and advisability of restructuring the DXCC Award program has brought a call for comment from DXers. With the study scheduled for completion at the end of December, there is still time to forward any opinions, suggestions, directions, or cautions on any possible, needed, or demanded changes.

In calling for comment, John Parrott, W4FRU, Chairman of the DXAC, noted that the big question to be decided is whether the DXCC should continue unchanged, be restructured with a fresh start as was done back in the 1940s after WW II, or whether a transition mechanism should be created to provide for a new DXCC "this without loss of credits for one's present standing in the DXCC. W4FRU states that in pursuing the study it will not be diminished by any recommended restructuring.

A release on this Board of Directors' directive commented that since WW II and the present DXCC "there have been many changes in the philosophy of accreditation, verification, criteria, and administration. Viewing the simple manner that administration of yesterday's DXCC was conducted, in contrast with today's rigid interpretation of the rules, has long struck me as being a bit unfair to many DXers, who are still, or will be, climbing the DXCC Awards ladder. This may well be as good a time as any to consider giving the DXCC a new face."

A DXer who has stuck with this item to this point might find himself immediately thinking to himself that possibly the light of sweetness and reason has finally penetrated and tomorrow will be a brighter day for all DXers. Maybe...

Some who have studied the half-century of the DXCC's existence have been impressed by the consistency of the program over the years, this in spite of the impression often heard that the criteria is as stretchable as a rubber band. The post-WW II DXCC went from 1947 to 1960 before any addition to the criteria was needed, and most of those since then have been refining attempts. But, as it often happens, the basic rules of "Don't tell me what you did for me yesterday, tell me what you are going to do for me tomorrow!" and its non-fraternal twin "Don't let them take it away from you!" have sometimes been an unspoken part of the criteria. Those who have want to keep, and those who have not want the rocky path to DX and the Honor Roll eased for their tired bones. But that's the way it has always been... mostly.

While some direct their attention to the award itself and the criteria, some have at times raised the economic factor, asking if possibly the DXCC itself has become expen-



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ASTRON	KANTRONICS	ROHN
ANTENNA SPECIALISTS	KDK	TELEX / HYGAIN
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Here are Karl Breitenbach, DF5DR, and Helmut Enger, DL1ECU, in front of the house used during the low sunspot effort in Liechtenstein this October. Also in on the effort was Rolf Hellbeck, DK1DN. They worked mainly from 80 up, but concentrated on the lower frequencies during the sunspot minimum. The QTH is 3500 feet above sea level, 1500 feet above the Rhine River in the valley below. They were active up to about mid-October. (DK1DN photo)

sive and difficult to administrate, possibly considered as not being cost effective. One only has to look at the pages needed to list the Honor Roll these days to wonder whether such

multitudes of callsigns, often scarcely noted by those not on the Honor Roll, can long continue. Add to this the DXCC listings, and the cost factors can be appreciated. But if you like to see your callsign in QST, you will hardly be enthusiastic about any further changes in the frequency of listings, let alone the dropping of them altogether.

Possibly the whole thing is more than just tidying up some loose ends, and a significant change in DXCC awards might be in the future. Keep in mind the back-logs in processing that have occurred in recent years, the in-fighting over the administration of the criteria (and the Pribilofs should easily come to mind), the what sometimes appears to be innovative application of the criteria, and the time taken to handle DXCC matters, and it is perhaps thought that the ultimate solution to present and future DXCC problems should be sought.

Don't take this proposal lightly. Keep in mind that while DXers can understand things that non-DXers cannot even see the form of, the DXers on the Board must consider other things beside DX. The non-DXers on the board may see things differently. This has happened in the past when non-DX types were most of the make-up of the Board and the lack of understanding of DX was evident.

Most DXers have some ideas on the DXCC.

## CQ DX Awards Program

### SSB

1490	YS1RRD	1493	W4UW
1491	WB9SAU	1494	SV1UG
1492	KC2FC	1495	K4ELV

### CW

670	F6ENU	674	G3YEC
671	NN2G	675	YU4ELI
672	N5FW	676	K4ELV
673	DL8CM		

### SSB Endorsements

310	W9BW/315	275	W4UW/288
310	K8LJG/314	275	K4JLD/277
310	VE7WJ/313	275	XE1MDX/275
300	I8LEL/308	200	K4ELV/220
300	KR9O/303	150	YS1RRD/153
300	N5FW/301	28 MHz	W4UW
275	K8T7/299	3.5/7 MHz	W4UW
275	K3LUE/297	1.8 MHz	W4UW
275	SV1JG/292	3.5/7 MHz	EA8TE

### CW Endorsements

300	DL8CM/309	250	K4JLD/253
275	K8LJG/292	200	K9DDO/205
275	N5FW/291	150	WP4F/150

Total number of active countries is 316. The basic award fee for subscribers to CQ is \$4. For non-subscribers, it is \$10. In order to qualify for the reduced subscriber rate, please enclose your latest CQ mailing label with your application. Endorsement stickers are \$1.00. Updates not involving the issuance of a sticker are made free when an s.a.s.e. is enclosed for confirmation of total. Rules and application forms for the CQ DX Awards Program may be obtained by sending a business size, No. 10 envelope, self-addressed and stamped, to CQ DX Awards Manager, Billy Williams, N4UF, Box 9673, Jacksonville, FL 32208 U.S.A. DX stations must include extra postage for air-mail reply. Please make all checks payable to the awards manager.

These should be conveyed to your Director. Tell what you want, or don't want. But be sure to include one point—no final action until there has been ample opportunity for all DXers to review the proposal and respond. Just be sure to include that request. And be sure to also direct your comments to the DXAC via Newington.

## AZ1D—Trinidad Island

The IARU Region Two will be meeting in Buenos Aires in late October, and AZ1D will be on the air from October 20–25th to mark the occasion.

This Trinidad Island is in Argentina in the vicinity of 62.00°W and 39.08°S. There is a town named Bahia Blanca at the head of the bay of Bahia Blanca, all of this to get you in the right neighborhood. The sponsoring group is noting that this is the first operation from this Trinidad Island and they will offer it for the IOTA Award. Look for the station on CW at 3510, 7005, 14040, 21020, and 28020 kHz. On SSB the action will be on 3690, 7090, 14200, 21300, and 28600 kHz. While no QSL information was mentioned in the advance notice, Mariano Viva, LU4EJ, is coordinating the effort, and if all else falls flat, you can look to LU4EJ to coordinate your QSL.

Marcelo Avila, LU5EIC, passes along some information on those AZ calls which have been heard the last couple of months. Mike notes that only the Radio Club Argentino uses this special prefix without a number portable, they signing AZ1ARU. Any other club using the AZ1ARU call has an identifier at the usual portable suffix spot. The Radio Club Boulogne, which normally signs LU1DCB, is signing AZ1ARU/15. Thus, note the identifier number is and has been important when you work AZ1ARU. All this is to mark the IX Plenary Assembly of Region II of the IARU in Buenos Aires. The special calls to mark the occasion are good through October 30th.



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## Greater Milwaukee Needs DX!

A recent note came through from Terry Zivney, N4TZ, the secretary-treasurer of the Greater Milwaukee DX Assn. Terry noted who the new club officers are along with what the club needs in the way of rare DX. First the newly appointed officers. They are Noll Amidzich, W9RN, as president, Dave Schmocker, KJ9I, vice-president, and Terry Zivney, N4TZ, the secretary-treasurer.

Along the way there have often been heard unfounded beliefs that the coasts work all the DX, that the inner heartlands are permanently tail-end Charlies. Then the suspicion started to show that those with a firm grip on most everything showing are the 5s/9s/0s. Ask any of these and hear their "Ha!" Ask most anyone outside these areas and hear their "Ah, ha!" So let us look at the ten most needed countries on the Greater Milwaukee Wish List.

- |                    |                      |
|--------------------|----------------------|
| 1. (tie) 3Y-Bouvet | 6. XV-Vietnam        |
| XZ-Burma           |                      |
| ZA-Albania         | 7. (tie) VU7-Andaman |
|                    | XW-Laos              |
| 4. (tie) 4W-Yemen  | YA-Afghanistan       |
| 70-South Yemen     | 5A-Libya             |

To get on the Honor Roll you will have to work some of these. Burma has not been on the air for over a quarter century or so, Albania had two brief efforts in early 1970s, and the Yemens have always been tough but there has been some action. But the others . . . XV/XW/VU7/YA and 5A at one time were easy, any number of stations being on the air. So what does all this prove? That you get on the Honor Roll by being a consistently active DXer, long in endurance, steeped in patience, and usually worn with the years. Most there follow this path. There are also pointers which say that each portion of the country believes that their conditions are the poorest, that they work without the blessings and advantages that others enjoy, and their road to the Honor Roll is long and rocky. And who might not be ready to say, "Them? Heck no! It's me who needs help and understanding." And they are right. All DXers need something. Just ask them. And some more so. And most DXers who have come to the scene in the last decade need most of the above.



This is Dr. Terry Langdon, G3MHV, at the operating position at BY1QH. Terry checked the station on a recent visit to Beijing, it being located on the top floor of a men's dormitory at Qing Hua University. G3MHV's home QTH is Warminster, Wilts, but he is currently in W6 Southern California to study Advanced DXing with the local DX types there.

## 5 Band WAZ No. 54

Carlos Viana, CT1FL, is the winner of 5B WAZ #54 and this DXer has operated from a number of the Portuguese territories in Africa, including a long run as CR7GJ. A Colonel in the Portuguese Army, Carlos currently is serving as the Judge President of the Tomar Military Tribunal. You can see CT1FL in the photo with his XYL and one of his daughters.

In addition to 5B WAZ, Carlos also holds 5B DXCC #659 and is on the DXCC Honor Roll, 5B WAC, and also earned DXCC when he operated CR7GJ. All of the present totals from CT1FL came after 1974 when Carlos returned from Africa. His only mode of operation is on phone.

The station has a TH6DXX up 55 feet with a couple of homemade slopers for 40 and 80. Carlos says that the antennas are nothing special design-wise; it is the ground system that he worked hard on.

He uses a Drake R4C/T4XB/TR4C and an RV4C and MN2000. He boosts with Heathkit's SB-200 and SB-220 plus, among other things, a Kenwood TS-820.

The hard zones to fill out the 5B WAZ were Zones 19 and 26 on 75 and 40. That was hard enough, but trying to get the needed QSLs in hand was even harder. It was a two-year wait to get the last Zone 26 QSL to round out 40 meters.

Carlos likes contests and has been out in front on more than one occasion. In 1981 and again in 1982 CT1FL was the top European station on 75 meter phone. There was an award in the ARRL DX Test in 1977 for the high bands. In



Carlos Viana, CT1FL (ex-CR7GJ), is winner of 5B WAZ #54 and a long-time DXer and contest-er. Here Carlos is in the shack with his XYL and daughter. Over the years Carlos has cornered a long list of operating awards and is still in the contests on the low bands, mostly on 75 phone for the contests. Two years ago Carlos won in a category in the ARRL DX Test. A member of the DXCC Honor Roll, Carlos says that his low-band expertise stems from having more wire in the ground than up in the air.

1982 Carlos was top scorer in the 75 meter band. Back at CR7GJ Carlos won in the high bands in 1972 and 1973 and in the CQ WW DX Test in 1973 in the multi-single category.

Carlos does not look for DX on the DX nets. In addition to his other interests, CT1FL is working on a history of his military service in the African possessions and the troops who served with him, this mostly for his family and some of the ones who were part of those days.

## HC1ATG, George Brumley

This is a DXer who has worked his way through a lot of the DX scene. George is a volunteer missionary, which means going out to a country, getting a job, and supporting himself while doing his missionary work. George was in Ethiopia from 1952 to 1959 signing ET3GB. After a few years back in the States, George went to Peru, where he signed OA6CV from 1972 to 1978. Returning again to Wichita, George and his XYL were thinking of settling down, but in a few years they were off again, this time to Ecuador, where he has been on the air from Quito since August 1985 as HC1ATG. In Ethiopia George ran a broadcast station for the then emperor, Haile Selassie. In Peru he headed the communications setup for a construction company.

George notes that he has been on the air long enough from Quito to get complaints on his QSLs. Those QSLing via the HC-QSL Bureau must have both patience and longevity; only 20 QSLs have been received via that agency since August 1985. Mail from the States and Europe usually runs about ten days transit but may take up to three weeks. The local postal service has difficulty in understanding the acronym "IRC." Never heard of them. So what do you do?

HC1ATG notes that he is living on his Social Security check and does not look with favor on adding expenses to take care of QSLing. And he feels his situation is not uncommon for those living overseas in LDCs. So if you really hunger for that overdue QSL, some thought might be given to sending a dollar bill in a no-see-through envelope, comparing this cost to that of an IRC. Seal tight and mail direct. Does this work? Not always, but it is better than

some bureaus. George acknowledges that he is well aware of overseas stations that promise much and deliver little. But these are the hazards of the course. Also, when the cost of postage in supplying QSLs becomes a problem, you can expect a good number of your needed ones to come via the bureaus. Eventually one learns that the first QSL is valued beyond belief. The ones that follow can come through the bureau; who needs them? Also keep in mind to avoid sending money to countries where currency restrictions are rigidly enforced.

George says he is often on 20, occasionally on 40, and on 10 and 15 when they open. He works both CW and SSB. Says he is enjoying yet his 48 years of activity and being 67 years old feels that he is definitely meriting the "Old Timer" status. Look for him in the contests and most days. Look for his QSL to come from his local address: Apartado 8512, Quito, Ecuador.

## Some Wind-Up DX Notes

Don't think that the status of the Pribilofs is dead. WESTLINK recently reported on a letter addressed by KL7Y to all Board members on the matter, raising a good number of points on the handling of the whole matter. A Golden Jubilee DXCC Award will be available in 1987 to mark the 50th anniversary of the DXCC Award. This was authorized at the July meeting of the ARRL Board. ZL1AMO might be showing from VK9-Christmas Island during October. 4U1VIC was mauled over again at the last Newington meeting; W7RM, the DXAC Liaison, noted that the post-WW II DXCC record was that the DXAC had never been overruled. Actually, the DXAC does not go all the way back to WW II, it being formed back in the 1970s along with the other advisory committees.



Visitors to Poland are being given a temporary license with an SO prefix. It takes a couple of months to get one. Heard during the summer was SO9UD, who signs G3UD back home. Barbados should be heard in the CQ WW CW Test, a contingent of W6s heading that way, surfboards, jammies, and everything else needed.

In a letter to the *The DX Bulletin* Vern Dameron, K1DRN, tells how he made it to the top of the Phone DXCC Honor Roll. All it took was 70 South Yemen. Back when most DXers were a bit younger, Vern would use his father's station while attending Boston University. Recently in checking his old logs—1966 entries to be exact—he found an entry for VS9ARV, located a possible QSL route, and guess what! The VS9ARV QSL showed in the mails. As was noted in *The DX Bulletin* "... even a casual DXer with limited time and money can make the top spot with persistence, patience, and care." And luck and longevity, a good QSL source, plus a bit more longevity. Keep in mind that this story covers more than a quarter century!

During September and October Botswana amateurs celebrated the 20th anniversary of independence by signing the special prefixes 800 and 802—the 800 prefix for Novice licenses, the 802 for full license holders. All this from Gerold Tjarks, A22TJ/802. JA5DQH collects amateur call license plates. If you have any treasures about to be discarded, remember Aki. The Australian authorities have some plans for work on and around Heard Island, mapping, etc., and Jim Smith, VK9NS/P29JS, is working to be the radio operator on the effort. Check the net at 14220 kHz at 0600Z for information on this.

## DX Ten Years Back

In November 1976 Lloyd and Iris Colvin were working the Caribbean DX stops, and Franz Langner, DJ9ZB, tried offering TA2ZB in the CQ WW Phone Test but found that a g.p. on 20 was not the best lash-up. Even back then they were feeling for the bottom of the sunspot cycle, the Stanford Solar Observatory noting the mean solar magnetic field to be in positive polarity and the Great Days of DXing might be nearing. Ville, OH2MM, signed C5AZ from Gambia during the DX Test, and LU2ZA was active from the South Orkneys. The W7RM DX Farm System was blanketing the Caribbean for the CQ WW CW Test, WA7OTT was sent to St. Lucia and Dominica, and K7VPF was working from a number of stops, including Antigua. GC4DAA was in the CW test from Guernsey, and Don Riebhoff was signing CT9AT in the same effort. 9D5A was also in the test, this being EP2SV in downtown Teheran. W5AT and W5NUT were on St. Martin signing FS7P/FG0CJK and slipping across the street to Sint Maarten to sign PJ8CM and PJ8JM. The FCC was moving to protest the Russian Woodpecker, a complaint being lodged with the International Telecommunication Union, specifically with the International Frequency Registration Board. Industry sources noted that most of the complaints, and violations, were in the amateur bands; HF frequencies used in the North Atlantic air service were not being bothered. PY0ZAE was on from Trinidad with Rocas Atoll promised by some Pys. VP8MS and VP8OT were on from South Georgia. SM0AGD was recovering from the typhus acquired while operating SM0AGD was recovering

from the typhus acquired while operating SM0AGD/ S2 in Bangladesh and was enroute home to Sweden.

## QSL Information

All of the following was compiled with help from W9LNQ, a watcher of the lonely night.

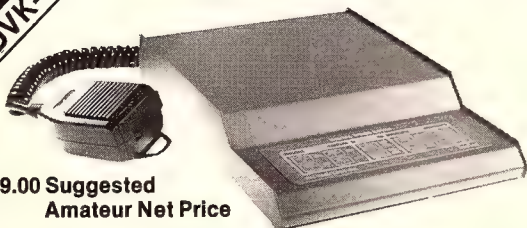
A71AU to DJ9ZB  
BV2DA to DL7FT  
C30BBP/p to PA3BMJ  
EJ5EP to ON5KL  
F0WASJ to N5DD  
F08MIR to N5RM  
HB8/DJ1WA to DJ0LC  
HC1MD/HC8 to K8LJG  
HL9CW WA2UUH  
JY9RL to WA6POZ  
K4YT/DU1 to KE3A  
KC4AAC W6MAB  
KP2AH to WA2YMX  
KX6RN to JA1ELY  
LA9PX/p to LA9PX  
LY4L to UA3LM  
LZ6SS to LZ1SS  
N7ET/DU7 to N7ET  
PY0TE to PY1RVY  
T2ITA to N4FJL  
TV6JUN to F5AM  
UJ8JB/U8C to UJ8JB  
UV100 UA9LBR  
UZ2FWA KA6V  
VZ2GTQ to W9OAM  
VP980 to N1AFC  
VQ9ZZ to N4GMR  
VR6HJL to G4AAL  
VS6DT to VS6ER  
W2JGR/VP2M to W2BIE  
M2MFY/VP2M to K2MFY  
K2OVS/VP2M to K2OVS  
KD2SX/VP2M to KD2SX/  
WB2RNT

Y86GST to Y23KE  
5H3ZD to K0LST  
7J1ACH to NG7X  
A71BK to Box 1556, Doha, Qatar  
B05A to P.O. Box 507, Fuchow, Peoples Republic of China  
C21RK to Box 139, Republic of Nauru, Pacific Ocean  
F6EWM to Xavier DeBaert, 6 rue Voltaire, 93270 Sevran, France  
J28EG POB 2417, Djibouti, Somalia  
J87CD to Sue Richardson, POB 975, St. Vincent, West Indies  
KC4USV to NSFA, FPO San Francisco 96555  
OD5AS to B.P. 121, Tripoli 604, Lebanon  
OD5SM to B.P. 70364, Antelias, Lebanon  
SV0CJ/SV5 to Box 349, Rhodes, Greece  
N4MJH/SV9 to POB 2002, Tel Aviv, Israel  
ZS25TJ to P.O. Box 2327, Johannesburg 2000, Republic of South Africa  
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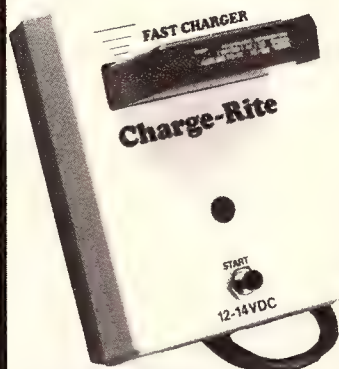
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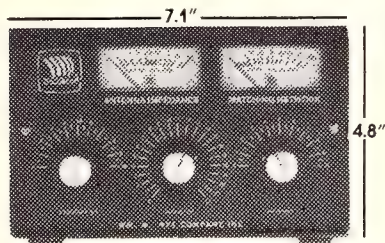
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100 watts	100H	100A	100B	100C	100D	100E
250 watts	250H	250A	250B	250C	250D	250E
500 watts	500H	500A	500B	500C	500D	500E
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## "HOW TO" FOR THE NEWCOMER TO AMATEUR RADIO

### How To Get Started In Amateur Radio—Part III, Conclusion

This is the final portion of a three-part article that licensed amateurs are asked to share with prospective amateurs.

#### Operating

Amateurs use a system of three-letter Q-signals to ask questions and to make statements. These Q-signals can be used in all modes of transmissions, but they are used with more frequency during code contacts. As an example, QTH? asks "where is your station located?" whereas QTH means "my station is located at." Obviously, if a foreign operator wants to find out where you are located, he can just send QTH? and if your response is QTH Bedford, Massachusetts, you are telling him that is your location. The use of Q-signals minimizes language problems. Q-signals are also used when no language barrier exists, such as when talking to another American. They are used in this case because they provide a fast way to ask questions and to make statements. An extensive list of Q-signals adapted to amateur radio use is available free to anyone requesting one and furnishing the usual SASE.

Another time-saving procedure commonly used in code contacts is generally referred to as the Phillips code. It is just a phonetic code which eliminates letters that can be left out without losing the meaning of the word. As an example, one operator might send R U WRKG DE CONTEST? to ask "Are you working the contest?" There are many other shortcuts which are peculiar to code operation. A fairly complete Phillips code list is also available free to anyone requesting one and supplying the usual SASE.

It is apparently not well known to the majority of licensed amateurs that it is now legal for them to allow an unlicensed guest to make a code contact from their stations. The licensed amateur is, of course, responsible for such transmissions. I believe it would be a much more realistic code test if each Novice license applicant were required to complete an unassisted two-way radio contact during which the names, locations, and signal reports of both operators were exchanged correctly. I often have my students make their first on-the-air contact at the time I supervise their FCC Novice Code test.

New operators should not hesitate to

ask more proficient amateurs to ease up on them. One simple way to get immediate extra consideration is to add a slant bar and the letter N after your callsign to tell others you are a Novice. If your FCC assigned callsign is KB6ADP, just identify as KB6ADP/N, which is legal. It is also acceptable to ask the other operator to slow down. This can be done in plain English or by simply using the QRS signal. It is inconsiderate of an experienced operator to use a lot of abbreviations, short cuts, and Q-signals when working an operator who has obviously had little opportunity to learn such things.

**Frequency Classifications.** The term HF is used to designate the high-frequency band which extends from 3 through 30 megaHertz. Almost all amateur radio operation occurs in the HF (3–30 MHz) and VHF (30–300 MHz) ranges. The amateur 80, 40, 20, 15, and 10 meter bands are all in the HF range. The amateur 6, 2, and 1.25 meter bands are in the VHF range. As the following examples show, the frequency classifications have a definite relationship: they usually start and end at a point where 3 is the significant number. The most commonly discussed frequency classifications are as follows:

#### Frequency

Abbrev.	Classification	Frequency
VLF	very low	below 30 kHz
LF	low	30–300 kHz
MF	medium	300–3000 kHz
HF	high	3–30 MHz
VHF	very high	30–300 MHz
UHF	ultra-high	300–3000 MHz
SHF	super-high	3000–30,000 MHz

Radio frequency (RF) is any frequency above 20 kiloHertz, whereas audio frequency (AF) is basically any frequency below 20 kHz.

**Novice Band Considerations.** It is a shock when a new Novice first tries to operate on a crowded band, and the shock can develop into frustration as layers of signals cover the signal one is trying to copy. Crowding gets so bad at times that there simply is no frequency one can use that won't cause interference to communications already in progress. This bad situation occurs most frequently on the 40 meter Novice band, because more Novices operate on this band than on the other three bands combined. The choice of the 40 meter band as an initial operating point is easy to understand. Novices are usually hesitant about trying to erect an 80 meter antenna, whereas they will put up a 40 meter antenna, since it only re-



Billy L. Dickinson, KA0TNT, of Saint George, Kansas took first place for Kansas in the 1985 ARRL Novice Roundup Contest. He has contacted 49 states, 7 Canadian provinces, and 10 countries so far. His station includes a Yaesu FT-101 transceiver, Galaxy GT-550 transceiver with RV-550 remote frequency control, HF-6V 10–80 meter vertical, homebrew 15 meter Yagi-Uda, and a 150 foot random-wire antenna. His callsign suffix is easy to remember.

quires half as much room for equivalent types of antennas. The performance of marginal equipment is usually satisfactory on 40 meters, even when it is unsatisfactory on 15 and 10 meters.

Since Novices quickly learn that a directional antenna system is desired for satisfactory operation on their 10 and/or 15 meter bands, they usually refrain from using these higher frequencies and become part of the din on 40 meters. The unfortunate result of these contributing factors is that the 40 meter Novice band does have several layers of signals during peak operating times. Remember that the 40 (7100–7150 kHz) and 80 (3700–3750 kHz) meter Novice bands are each just 50 kHz wide, whereas the 10 (28.1–28.2 MHz) and 15 (21.1–21.2 MHz) meter Novice bands are each 100 kHz wide. The 40 meter Novice band becomes even more of a mess when conditions are good for long-range reception and international shortwave broadcast stations boom in at every 5 kHz point (7105, 7110, etc.) throughout the band. These shortwave broadcast stations are legal in Region One (Europe) and Region Three (much of the Southern Hemisphere) where 7000–7100 kHz is the maximum extent of the 40 meter amateur band. It is just in Region Two (North, Central, and





Here is Jack Bigelow, KA9JOL (left), presenting an award to Charlie Banks, K9IS, and Ruth Banks, K9RB, for their help in licensing people. Jack is president of the Fox Cities Amateur Radio Club in Neenah, Wisconsin. Ruth and Charlie also received honorary life memberships in the club. They are representative of the thousands of people who help those who want to become licensed amateurs or those who want to upgrade to higher class tickets.

South Americas) that the 7000-7300 kHz wider spectrum 40 meter band can be used by amateurs.

If all of this explanation has convinced you that you should normally operate on any Novice band other than 40 meters, you have received my message without error. The first choice for Novice opera-

tion should now be the 15 meter band, which offers superb long-distance communications. Antennas for 15 meters are smaller, lighter, and less expensive than their counterpart antennas for use on the 40 and 80 meter bands. The light weight of a 15 meter directional antenna (such as a Yagi-Uda, delta loop, or quad) makes it possible to mount it on an inexpensive, telescoping, push-up TV antenna mast and to rotate it with a relatively low-cost antenna rotator.

The 15 meter band's DX capability dies about sunset. It is essential for a Novice to have both low-band (40 and/or 80 meters) and high-band (10 and/or 15 meters) operating capability to have operating capability at any time of the day or night. The 15 meter Novice band provides very good long-distance communication capability and it is useful during more hours of the day then one can work DX on the 10 meter band. However, 15 meter antennas are larger, heavier, and more expensive than 10 meter equivalent antennas. A suitable initial Novice station antenna system is a 15 meter rotatable directional antenna for daytime operation and a longwire antenna (with tuner) for 80 and 40 meter nighttime operation.

Those of us who instruct amateur radio licensing courses often make it a point to stress good operating practices and pride in our Amateur Radio Service. Most operators do have a lot of pride in both our service and their own good operating. Unfortunately, it is the occasional poor operator who is easily noticed and remembered. There is no way to know about the many good operators who avoid unnecessary interference by listening on a frequency before using it to ascertain they are not going to bother a contact already in progress.

## QSL Cards

Amateurs use specially printed cards to confirm their two-way radio contacts. These cards are called QSL cards, since the Q-signal QSL means "I am acknowledging receipt" (of your message). New amateurs usually underestimate how many QSL cards they will need. The most common initial orders of QSLs are 100 or 200 cards, which the average amateur runs out of shortly after she/he gets active on the air. The minimum number of QSLs one should initially order is 500, with 1000 being a more realistic quantity. Basically, one has to send cards to receive them, and it is more effective to QSL promptly if one wants to receive a card in return. I QSL each first contact with a different amateur, but this is not standard practice with most amateurs. A lot of amateurs just send QSLs in response to received cards, which is a reasonable procedure. You will need received QSLs if you decide to seek some of the thousands of operating awards that are available. The QSL cards one re-

ceives while using a lower class license count towards earning awards when one upgrades to a higher class license.

The January through March 1979 issues of CQ provide full particulars regarding design, use, distribution, storage, and display of QSL cards. If you have access to these issues, you can benefit by reading them.

After you have purchased equipment and accessories and you have set up your station, QSL cards and postage will be continuing expenses. It costs as much to mail a trash QSL as a good one, so you may as well get good cards.

## Printed Material

The August 1986 issue of CQ lists articles available in previous issues of CQ, plus printed aids available from myself. Previous issues of CQ are usually available at \$2.50 each from CQ, 76 North Broadway, Hicksville, NY 11801. A list of the printed aids I have on hand will be sent to each person who requests it and sends a self-addressed, stamped envelope (SASE) to me at my California address. Printed material has been separated into six groups to permit desired items to be found easily. In sequence, these groups are introduction, code, theory, miscellaneous, station, and operating. Naturally, new items are continually added and outdated items are deleted from the group of printed aids I distribute to licensing course students. I send one set of current printed items with \$15 being payment in full, including shipping costs.

## Conclusion

This article is intended to provide a simple introduction to amateur radio. It is hoped that prospective amateurs will read it and decide to become licensed.

## Photographs Wanted

Photographs of Novices in their shacks provide introductions to a few of the newer amateurs. Photograph size is unimportant, but good definition, contrast, and subject matter are important. Color pictures can be used, but black-and-white photographs are preferred. Operating activities and achievements, plus a self-introduction, are needed with each picture. Send SASE if a picture must be returned. A free one-year CQ subscription (or renewal) is awarded to the one amateur whose picture I select as the winner for the month. If you are a subscriber, please enclose the mailing label (or copy) from your latest CQ issue. One award is made each month, no matter how many photographs are printed. DX amateurs, who frequently work the American Novice bands, are also urged to submit photographs. I have not received a picture from a Novice in Hawaii or Vermont.

73, Bill, W6DDB

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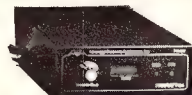
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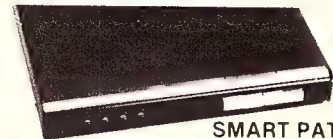


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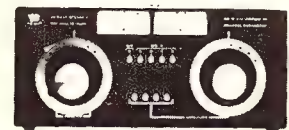
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## PRINCIPLES, PRACTICES, AND PROJECTS FOR THE VHFER

### ZZZAP!

**T**hat is the sound I heard at 3:05 a.m. on August 2, 1986. We were in the throes of a major electrical storm, complete with heavy rains, moderate winds, and lots and lots of bright flashes with loud thundering accompaniment. These are not unusual conditions for early August in New Jersey, so we retired to bed around midnight without giving the storm much attention. A few thunderclaps were very loud, and they seemed to precisely coincide with lightning flashes, but still I wasn't disturbed, having been through this before.

Or so I thought. At 3:05 a.m. there occurred a flash so bright and a clap so loud that we were awakened to what was surely a nearby nuclear blast. The lights blinked momentarily (we always leave a few on at night), and we heard a startling "zzzap!" followed by the recognizable fragrance of ozone. Thinking about all the antennas I hadn't disconnected from equipment (I'd been living on this hilltop for over eight years and hadn't any problems with lightning), I raced downstairs to the shack to check for smoke and flames. There weren't any, so I went back to bed, feeling a bit foolish.

The next day brought bright sunshine and lots of blown out electronic equipment. My 2 meter repeater which had called my garage "home" for the past couple of years was dead. Not a receiver in the shack functioned. Our telephone answering machine and the tuner section of our VCR were lifeless. There was never an electric-power or telephone-line failure, and our telephone instruments (good old Bell equipment) all worked fine, as did all electronic equipment which was not connected to outside communications lines or antennas. But lots of stuff was dead—real dead.

I spent all day repairing gear which had become dysfunctional as the apparent result of a nearby, but not direct, lightning strike. The repeater had blown fuses, a tripped "crowbar" circuit in its power supply, and a few failed semiconductor devices; still, it didn't take too long to fix because I was so familiar with the circuitry. Every single GaAsFET preamp I owned (six of them) had failed, and in some cases the on-board voltage regulators in these preamps were catastrophically destroyed as well. The helical GaAsFET preselector on the repeater's receiver

had an FET which was literally cracked in two and, needless to say, not working. Two of my shack power supplies, which I leave "on" continuously to power various circuits which have a warm-up cycle (like the local oscillators in my VHF/UHF transverters) were down but not forgotten; they were producing no DC output, but their line fuses were intact and panel pilot lamps glowing.

It took another two weeks of part-time repair work to get things going again. I shipped a couple of A.R.R. GaAsFET preamps back to their manufacturer for repair, and these folks came through as usual with rapid, quality service. The total turnaround time, including mail, for the A.R.R. preamps was exactly one week. I wish every manufacturer offered this kind of service. The helical preselector was returned to its manufacturer, GLB Electronics, but the news wasn't so good. The unit used a 3SK97 GaAsFET, no longer available from GLB. The newer designs use MRF901 bipolar transistors, but the older circuit will not accommodate the new transistor; thus, the blown-out unit was deemed "irreparable" and returned. I guess I'll have to find a 3SK97 and service the unit myself.

The Astron 35 amp power supplies had blown out IC regulators and cost only a few dollars and maybe half an hour to repair. My Radio Shack telephone answering machine has so many blown out parts that it is nearly beyond hope. I replaced the 7900 quad Norton (linear) amplifiers and many discrete transistors—some of which are PNP and difficult to find—but there seemed to be another blown out part adjacent to each one replaced. At this writing, I am about to shoot the machine and put it out of its misery. Funny thing is, the answering machine was not powered up during the storm and the telephone instrument connected in parallel with it wasn't damaged at all. The lightning spike must have come in the telephone line, propagated through or around the line coupling transformer, and zapped everything in its path.

All the ham gear is repaired and I'm back on the air, but I won't soon forget the Night of the Big Storm. I should mention that in my neighborhood, all utility lines are buried beneath the ground, and the nearest overhead utility lines are about a half-mile away; electric, telephone, and cable TV service are all fed to the house via underground conduits, so I thought I was fairly immune from "direct strikes"

to these services. What did all the damage, then, must have been an induced surge which exhibited such enormous  $di/dt$  that all my circuit breakers, and the majority of equipment fuses, held together just fine while allowing more sensitive semiconductor circuits to literally vaporize. Possibly the use of properly installed gas-discharge transient voltage suppressors in all the antenna transmission lines would have prevented some of the damage; it's hard to say.

### VHF WPX Update

Yeah, I know the contest was back in July. However, we're always excited to see how people did, and at this writing about 200 logs have been received indicating so-so band conditions around the world. Six meters was pretty hot for the VHF WPX Contest, but not as hot as it was for the QSO Party in June. The higher bands were just average, and that seems an almost worldwide consensus. Some big scores received thus far include: F6IFR, multi-single group from France who had the world-high score last year, with 133K; N2BJ, single-multi from NY, with 108K; GJ4ICD, our last year's European single op high scorer, really outdid himself this time with 90K; KB7IJ/5, an outstanding single-single effort, 47K; WB9MSV, single-multi, 51K; F6HMQ/p, single-single, 32K; and other U.S. single/multi efforts breaking 40K points (claimed) include N0LL, KD5RO, and KA8MRI/9. Single-single stations breaking 30K points (claimed) include NW5E and KI3L/5. KC2PX has the early claimed high score in multi-multi (167K), with NN8H following at 120K, but we understand the W1XX multi-op resulted in about 185K—maybe the world-high score? And kudos to K7IDX/7, who achieved 16K+ in the portable category (15K in "FM only") using just 2 meter QRP from a hilltop site in WA.

We'll continue to receive logs up through publication time for this issue, and there's no telling what those logs will contain. We'll try to have a "high-claimed scores" bulletin in the January or February '87 issue, along with the announcement for next July's contest.

By the time this is printed, the September VHF QSO Party will have come and gone, and we'll be planning for the January Sweepstakes. Remember, you needn't be a contender to enjoy these operating events. Contests give us all an opportuni-



ty to check out our equipment and work new states, grids, counties, or whatever. Participate and have fun!

## Pony Express

... Is what many of us call the U.S. Mail, a medium by which we receive written communication. Here's a review of some interesting reader comments.

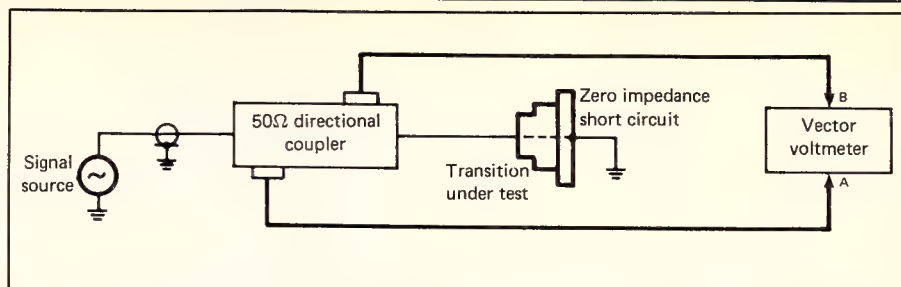
Gerald Cromer, K4NHN, wrote regarding the use of BNC connectors at 70 cm. He was replying to my comment (June column) that BNC connectors are quite lossless at 70 cm, and Gerald wrote, "I was at the ATV meeting (at Dayton) and had talked about 70 cm slot antennas. I don't know if you were there and was making reference to a comment I had made at the meeting. My statement to the group was that I didn't recommend using BNC transitions in the coax line feeding the slot antenna because of the SWR they entered (sic) into the line ...."

Well, Gerald, I was not referring to your statement, but it is an interesting one. Actually, I was referring to a fellow who refused to use a 70 cm receive preamplifier with BNC receptacles because the BNC's were so "lossy." He insisted that only type N were low loss enough to be usable at 432 MHz. This is a statement with which I take issue, having measured hundreds of standard military (male and female, panel and cable-mount) BNC connectors and never finding any to be lossy below about 3 GHz. As you know, the geometry of the active portion of a type-N connector is essentially identical to a BNC.

It is true that some BNC transitions (between-series adapters, especially) might introduce a measurable impedance mismatch to a 50 ohm line, with some resultant loss. My rule of thumb about between-series adapters, especially above 1 GHz, is, "When in doubt, leave them out!" While some of the more costly transitions have tightly controlled geometry, Teflon dielectrics, and gold-plated mating surfaces which result in excellent impedance consistency through the microwave region, many of the cheaper ones don't.

Gerald goes on to say, "We have a lot of BNC connectors in our microwave system at work—loss is no problem—but you never see BNC transitions used. A letter does not present a good chance to explain the procedure used to check the BNC transitions, but I feel I used standard engineering practices ...."

There are many fine ways to measure transition performance. One I've used a lot is to terminate the transition under test with a microwave short circuit (essentially zero impedance through several GHz) and sweep the input to the transition, measuring return loss across the RF spectrum of concern. A high-quality directional coupler (H-P 778D, for example) and vector voltmeter may be used to measure



*Fig. 1—Typical test setup for evaluating coaxial transitions. Procedure is as follows. (1) Terminate directional coupler directly with coaxial "short." (2) Measure return loss at frequency of interest; this should measure nearly 0.0 dB; record this quantity. (3) Install transition under test between coupler and "short." (4) Repeat step 2. The difference between this quantity and that recorded in step 2 equals loss in transition.*

return loss and phase angle of the reflected signal. At lower frequencies, return loss will be nearly zero (indicating infinite VSWR), but as the transition "runs out of gas" (i.e., introduces loss), return loss will improve. With this simple system one may evaluate RF devices across the popular UHF amateur spectrum (fig. 1).

A letter from Phil Wilson, WA6CRA/4, tells of his recent activities. Phil lives near Roanoke, Virginia on a ridge near the Blue Ridge Parkway, elevation about 2200 feet above sea level. He's achieved 50 MHz WAS and has worked all Canadian districts, 40 countries, and 175 grid squares on the band. WA6CRA/4 is also active on 144 and 432 MHz, using 60 watt and 100 watt rigs, respectively, and is getting fired up on 10 GHz with about 200 mw. Phil was looking forward to the CQ VHF WPX Contest when he wrote (back in July), and is anticipating a few mountain-top VHF expeditions with his son, a new amateur. What's your son's call, Phil?

Robert "Bondy" Bond, WD6BCN, of Oxnard, California wrote to tell us about his 6 meter activities. Bondy is a member of the Ventura County Amateur Radio Club and is an active VHF contester. He's been active on 50 MHz since June 1982 and has worked all over the country with 10 watts on SSB, but now has a Drake TR-6 (300 watts PEP) and has worked 138 grids and 40 states thus far; not bad for a sunspot cycle slump, Bondy! WD6BCN is also active on OSCAR 10 and is glad the "bird" came back to life after a prolonged down period. Most recently, Bondy, who is 68 years young and also a model-railroad enthusiast, worked VE1BB (Maritime Provinces, northeastern Canada) and PP2ZDD (Brazil) on 6 meters. Keep up the good work, Bondy!

Elsewhere in California, Ric Haworth, WI6I, of Canoga Park, has been working some incredible DX on 50 MHz. Ric says, "Saturday, July 26th was the best 6 meter opening I have heard in my year and a half on the band. I was hearing stations from the W4 through W0 call areas, and northern California on back scatter. After the dust settled, I had 21 new grids and 5 new states in the WI6I log. The new ones

bring my grid total to something over 150 ...."

This would be impressive under any conditions, but Ric has been using a 5 watt Mizuho (Ace Communications) VXC-controlled rig, which is something like a handie-talkie for 6 meter SSB. His antenna is a 5-element Cushcraft Yagi at 37 feet above ground. I imagine a great deal of operating prowess, coupled with patience, is responsible for Ric's successful DX work. When he wrote, Ric was getting ready for a move to Rhode Island and inquired if FN41 is a "rare one." I'm afraid not, Ric, but anything is rarer than FN20, where I live.

Still another California reader (do you guys plan this?), Keith Thompson, K6PVS, of Hesperia, wrote to tell of his experiences with auroral-influenced scatter propagation on 2 meters. On August 4 Keith worked W5HM and NG4C in New Mexico, plus he reports other contacts with Texas and Oklahoma, via unusual paths peaking 35 to 40 degrees farther north than the direct (great-circle) paths. Keith writes, "CW signals were T5-6 and SSB (signals were) difficult to understand. The opening gave me 4 new grids, which gives me 96 worked via terrestrial propagation. I later talked with W5HM on the telephone, and he reported his antennas were also to the north by 35 to 40 degrees." Interesting report, Keith.

K6PVS is a proponent of a DX window for 2 meters, and says we should "establish a national calling frequency for meteor-scatter work. I would like to see a pair of frequencies that would be used other than 144.200." As I've written in previous columns, I think the only way to create new calling frequencies is by convention, or actual usage. Here in the northeastern U.S. I've been pushing for a DX window from 144.110 to 144.120 for weak-signal SSB work. It is unbelievable that people still set up meteor-scatter skeds on 144.200. There is just no excuse for this.

Back in February WA1JXN/C6A was operating from the Bahamas on 144.200, trying to complete m.s. skeds with stations here in the northeast. What a zoo!



Lance, an accomplished moonbouncer, should have known better. I tape-recorded this circus for a long while one evening before I finally became tired and shut off the receiver. Surely, people, we can find a better frequency on which to conduct our weak-signal work.

K6PVS also reports that Jim, N7ALX, has spent a good deal of time and effort promoting grid-square activity in the west. According to Keith, N7ALX spent nearly a week in mid-August traveling through rare grids DM17, 18, and 29, giving "new ones" to many of his happy contacts. This is a wonderful display of the true spirit of amateur radio. Maybe Jim will inspire more of us to go a few steps out of our way to make someone happy.

## New Equipment

Tactical Electronics Corporation has announced a broad range of VHF/UHF amateur products which should appeal to experimenters or folks who wish to explore higher bands without putting too much strain on their budgets. Most of the items in their latest catalog are available as reasonably priced kits. Some of the more interesting products include a 2-meter RF-switched, PIN-diode protected MOSFET receive preamp, rated for 50 watts of transmit power and priced at just \$28.75 (kit); a 70 cm RF-switched 10 watt output power amplifier especially designed for ATV service for just \$56.85 (kit); a 70 cm GaAsFET receive preamp with 1.8 dB nf, PIN-diode protection, and antenna-mounting provision for \$24.50 (kit); a 432 to 144 MHz receive converter, 2.5 dB nf, for \$53.75 (kit, less crystal); a 70 cm 1 watt ATV video transmitter for \$136.00 assembled; and a 432 to 1296 MHz varactor tripler rated at 4 watts output for 10 watts drive for \$126.75 assembled. Add to this a number of available subassemblies for the UHF/micro-

wave tinkerer (like a 500 mw "microwave drive source" which delivers +27 dBm output in the 375-525 MHz range for a variety of multiplying and mixing applications), and you have an interesting catalog of European-manufactured products. For further information, contact Tactical Electronics Corporation, P.O. Box 1743, Melbourne, FL 32902.

Want a bigger signal on 2 meters? You might want to try a new "Commander II" linear amplifier from C.C.I.E. Manufacturing. The Commander II is a self-contained desktop linear amplifier for the 144 MHz amateur band, featuring a 3CX800A7 ceramic-metal triode capable of delivering 650 watts RF output in SSB/CW service. The husky little unit has a self-contained 117/234 VAC power supply and an-

tenna changeover relay, is American-made, and is currently priced at \$988 plus shipping. I haven't used one of these yet, but would like to review one for CQ (hint, hint) and would be glad to put it through the paces in an RF lab environment. C.C.I.E. proprietor Pat Stein, N8BRA, warned me that after a couple of weeks with one of his amps, I'd get so attached to it that I'd want to keep it. Maybe so. My homebrew 2 meter kilowatt isn't exactly a desktop affair (grunt), and it might be nice to have such a tidy package. For further information on this and other C.C.I.E. products, contact Pat at 104 W. Vine St., Edgerton, OH 43517.

The high-tech line of products from muTek Ltd. (U.K.) is now available from "Q" Products, 417 Staudaher St., Bozeman, MT 59715. Gene Shea, KB7Q, is importing muTek transverters, preamplifiers, retrofit front-end boards for ICOM and Yaesu multimode rigs, and bandpass filters intended for use by the serious VHF/UHFer. The popular TVVF50A and TVVF50C 6 meter transverters, which convert 28 and 144 MHz to 50 MHz, respectively, are available for \$334.95 (A) and \$289.95 (C), and the 1 kw-rated mast-head preamp for 2 meters, model gfb144e, previously reviewed in this column, is available for \$284.95 from "Q" Products. For further information write to Gene, or call him at (406) 587-9150.

Next month we should have the review of the Tokyo High Power 100 watt amplifier for 70 cm and more good stuff. The new 44-element 23 cm Yagi from KLM just arrived, and we'll be testing it out as weather permits. Write if you get work. Better yet, write if you work something interesting on VHF.

73, Steve, WB2WIK



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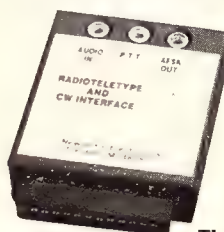
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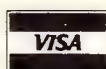
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## THE SCIENCE OF PREDICTING RADIO CONDITIONS

### Bulletin

**S**ince this issue of *CQ* should reach most subscribers prior to the start of the *CQ* World-Wide DX Phone Contest weekend of October 25-26, here is an updated day-to-day forecast of general conditions expected for the contest weekend made at press time. Conditions continue to look Low Normal for the entire weekend, much as forecast in last month's column. Despite exceptionally low solar activity, this could be a fairly good DX contest period.

### CW Contest Weekend

The *CQ* World-Wide DX CW Contest weekend is November 29 and 30. Complete DX predictions for all HF bands to all areas of the world for use during the CW contest weekend appeared in last month's column. At press time, it appears that there is a strong likelihood that a radio storm could develop during the CW weekend, driving HF propagation conditions to mostly Below Normal. An updated forecast will appear at the beginning of next month's column in time for use during the CW Contest weekend. See the Last Minute Forecast appearing in this month's column for a day-to-day forecast of conditions expected throughout the entire month of November.

A smoothed sunspot number of approximately 7 is forecast for November 1986. By comparison, solar activity during last year's CW contest period was at a level of 17, and during the peak year of 1979 it stood at 162!

The exceptionally low level of solar activity expected during the 1986 CW contest weekend, coupled with the possibility of a radio storm, makes the challenge greater than ever for digging out DX contacts. As difficult as this may seem compared to previous years, the DX should still be out there during the 1986 contest, but it will take greater patience to pile up points, and a greater knowledge of where to look for the openings. To help in providing that knowledge, the following is a summary of conditions and other propagation tips that should be helpful during the CW DX Contest weekend specifically, and during the month of November generally. Be sure to refer to the more detailed data appearing in last month's column.

11307 Clara Street, Silver Spring, MD 20902

### LAST MINUTE FORECAST

Day-to-Day Conditions Expected for November 1986

Propagation Index.....	Expected Signal Quality			
	(4)	(3)	(2)	(1)
Above Normal: 6, 19, 25	A	A	B	C
High Normal: 4, 7-8, 17-18, 24	A	B	C	C-D
Low Normal: 1, 5, 9, 14-16, 20, 22-23, 26-28	A-B	B-C	C-D	D-E
Below Normal: 2-3, 12-13, 21, 29-30	B-C	C-D	D-E	E
Disturbed: 10-11	C-E	D-E	E	E

Where expected signal quality is: A—Excellent opening, exceptionally strong, steady signals greater than S9.

B—Good opening, moderately strong signals varying between S6 and S9, with little fading or noise.

C—Fair opening, signals between moderately strong and weak, varying between S3 and S6, with some fading and noise.

D—Poor opening, with weak signals varying between S1 and S3, and with considerable fading and noise.

E—No opening expected.

### HOW TO USE THIS FORECAST

1. Find *propagation index* associated with particular band opening from Propagation Charts appearing on the following pages.
2. With the *propagation index*, use the above table to find the expected signal quality associated with the band opening for any day of the month. For example, an opening shown in the charts with a *propagation index* of 3 will be good to fair (B-C) on Nov. 1st, fair to poor (C-D) on the 2nd and 3rd, good (B) on the 4th, etc. Below Normal conditions are expected for the WW DX CW Contest weekend of Nov. 29th and 30th.

This month's column also contains short-skip propagation charts for use between distances of 50 and 2300 miles, and between the lower 48 states and Hawaii and Alaska.

### Contest Tips

**Midnight to Sunrise:** Check 20 meters for openings to South Pacific until midnight, or perhaps as late as 1 a.m. in the EST and CST time zones, and until 3 a.m. in MST and PST zones. Band may also remain open for an hour or so after midnight to deep South America and Antarctica. Best band during this time period should be 40 meters. Look for openings towards Europe, the Middle East, and parts of Africa until 3 a.m. in EST and 2 a.m. in CST zones. Check for long-path openings between 6 and 8 a.m. in PST zones. Good openings from all time zones towards South America should be possible, with signals strongest to the Caribbean area, Central America, and the northern countries of South America between midnight and 5 a.m. in EST and CST zones and to 4 a.m. in MST and PST zones. The path towards the South Pacific looks good on 40 meters between midnight and sunrise in MST and PST zones. Weakish openings

to the Far East and Asia may be possible from the PST zone from midnight to sunrise. There's also the possibility of a 40 meter opening to Antarctica between 2 and 5 a.m. in EST and CST zones and between midnight and 5 a.m. in MST and PST zones. Eighty should open from EST and CST zones to Europe, parts of Africa, and the Middle East until 2 a.m., possibly for an hour or so longer in the EST zone. Eighty also looks good from PST and MST zones to the South Pacific from midnight almost to sunrise, and from the EST and CST zones from about 3 a.m. to almost sunrise. Check for good 80 meter openings to the Caribbean, Central America, and the northern countries of South America between midnight and 5 a.m., and to 3 a.m. for deeper openings into South America, in all time zones. There's also a possibility of an opening to the Far East and Asia from the PST zone between 1 and 5 a.m. Openings on 160 meters should be possible from the EST and CST zones to Europe between midnight and 2 a.m. In PST zone check for 160 meter openings towards the South Pacific between 2 a.m. and sunrise. Openings towards the Caribbean, Central America, and the northern countries of South America should be possible from all time zones from about 2 a.m. to 4 a.m.

**Sunrise to Sunset:** Check for possible 10 meter openings to Europe from EST and possibly CST zones between 9 and 11 a.m., for openings to Africa between 9 a.m. and noon. Ten meter openings into South America should be possible between 9 a.m. and 3 p.m. from all time zones. Check for openings towards the South Pacific between 1 and 5 p.m. in PST zone, and possibly MST as well. Look for openings from PST zone to the Far East and Asia between 2 and 5 p.m. Conditions may have to be at least High Normal for the 10 meter band to open. DX conditions on 15 meters should hold up well during the entire daylight period. Check for openings towards South America as early as 8 a.m., with the band peaking in this direction between noon and 4 p.m. Good openings are expected toward Africa between 10 a.m. and 2 p.m. in EST and CST zones, and until noon in MST and PST zones. Band should open to Europe from EST and CST zones between 8 a.m., and noon, and until 10 a.m. in MST and PST zones. Check for openings towards South Pacific between 2 and 6 p.m. in all zones, with the band remaining open for an hour or so longer in PST zone. Fifteen meters may also open towards the Far East and Asia between 4 p.m. and sunset in PST and MST zones. Twenty meters should



#### HOW TO USE THE SHORT-SKIP CHARTS

1. In the Short-Skip Chart, the predicted times of openings can be found under the appropriate distance column of a particular meter band (10 through 160 meters) as shown in the left-hand column of the chart. For the Alaska and Hawaii Charts the predicted times of openings are found under the appropriate meter band column (15 through 80 meters) for a particular geographical region of the continental USA as shown in the left-hand column of the charts. An \* indicates the best time to listen for 80-meter openings.

2. The *propagation index* is the number that appears in ( ) after the time of each predicted opening. On the Short-Skip Chart, where two numerals are shown within a single set of parentheses, the first applies to the shorter distance for which the forecast is made, and the second to the greater distance. The index indicates the number of days during the month on which the opening is expected to take place, as follows:

- (4) Opening should occur on more than 22 days
- (3) Opening should occur between 14 and 22 days
- (2) Opening should occur between 7 and 13 days
- (1) Opening should occur on less than 7 days

Refer to the "Last Minute Forecast" at the beginning of this column for the actual dates on which an opening with a specific *propagation index* is likely to occur, and the signal quality that can be expected.

3. Times shown in the Charts are in the 24-hour system, where 00 is midnight; 12 is noon; 01 is 1 A.M.; 13 is 1 P.M., etc. On the Short-Skip Chart appropriate *standard time* is used at the *path midpoint*. For example on a circuit between Maine and Florida, the time shown would be EST, on a circuit between N.Y. and Texas, the time at the midpoint would be CST, etc. Times shown in the Hawaii Chart are in HST. To convert to standard time in other USA time zones add 2 hours in the PST zone; 3 hours in the MST zone; 4 hours in the CST zone; and 5 hours in the EST zone. Add 10 hours to convert from HST to GMT. For example, when it is 12 noon in Honolulu, it is 14 or 2 P.M. in Los Angeles; 17 or 5 P.M. in Washington, D.C.; and 22 GMT. Time shown in the Alaska Chart is given in GMT. To convert to *standard time* in other areas of the USA subtract 8 hours in the PST zone; 7 hours in the MST zone; 6 hours in the CST zone; and 5 hours in the EST zone. For example, at 20 GMT it is 15 or 3 P.M. in N.Y.C.

4. The Short-Skip Chart is based upon a transmitted power of 75 watts c.w. or 300 watts p.e.p. on sideband; the Alaska and Hawaii Charts are based upon a transmitter power of 250 watts c.w. or 1 kw p.e.p. on sideband. A dipole antenna a quarter-wavelength above ground is assumed for 160 and 80 meters, a half-wave above ground on 40 and 20 meters, and a wavelength above ground on 15 and 10 meters. For each 10 dB gain above these reference levels, the *propagation index* will increase by one level for each 10 dB loss, it will lower by one level.

5. Propagation data contained in the Charts has been prepared from basic data published by the Institute for Telecommunication Sciences of the U.S. Dept. of Commerce, Boulder, Colorado 80302.

open to almost all areas of the world just after sunrise, and remain open with strong signal levels to at least 10 a.m. From 10 a.m. through the early afternoon signals will probably weaken, with the band only open towards Europe, northern Africa, the Caribbean, Central America, the northern countries of South America and short openings towards the South Pacific. After 2 p.m. signals should begin to peak again on 20 meters towards Africa, and remain strong to 3 p.m. in the MST and PST zones, and to as late as 5 p.m. in the CST and EST zones. In the EST and CST zones, check also for long-path openings to Australasia between 3 and 5 p.m., and look for short-path openings to Australasia from the PST and MST zones between 4 p.m. and sunset. Expect strong signal openings to all of Latin America from about 4 p.m. onward. Forty meters should begin to open towards Europe and to the Caribbean, Central America, and the northern countries of South America about an hour or so before sunset in all time zones, but signals will be weakish.

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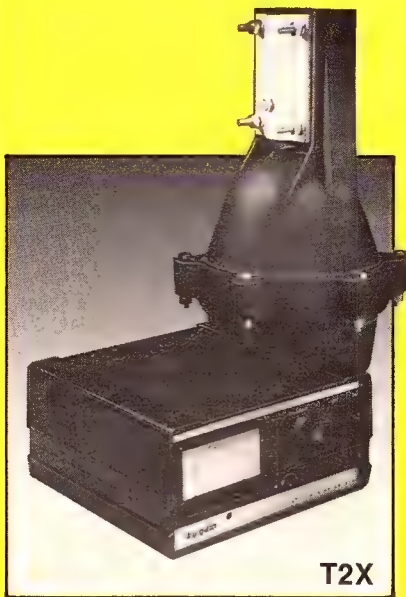
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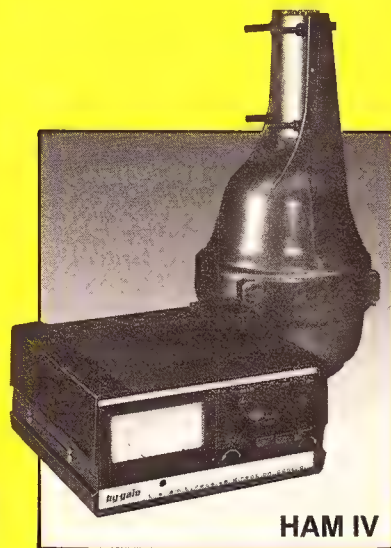


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# **CQ Short-Skip Propagation Chart** **November & December 1986** **Local Standard Time At Path Mid-Point** **(24-Hour Time)**

Band (Meters)	Distance Between Stations (Miles)			
	50-250	250-750	750-1300	1300-2300
10	Nil	Nil	11-16 (0-1)	11-16 (1-0)
15	Nil	10-16 (0-1)	09-10 (0-1) 10-12 (1) 12-16 (1-2) 14-15 (2-3) 15-16 (2) 16-17 (1) 17-18 (0-1)	09-10 (1) 10-12 (1-3) 12-14 (2-4) 14-15 (2-3) 15-16 (2) 16-17 (1) 17-18 (0-1)
20	Nil	09-11 (0-1) 11-16 (0-2) 16-19 (0-1)	08-09 (0-1) 09-11 (1-4) 11-16 (2-4) 16-17 (1-3) 17-18 (1-2) 18-19 (1) 19-21 (0-1)	07-08 (0-1) 08-09 (1-3) 09-11 (4) 11-15 (4-3) 15-16 (4) 16-17 (3) 17-18 (2-3) 18-19 (1-2) 19-20 (1)
40	07-09 (0-1) 09-10 (1-3) 10-15 (3-4) 15-16 (2-3) 16-18 (1-2) 18-20 (0-1)	07-09 (1-3) 09-10 (3) 10-15 (4-3) 15-16 (3-4) 16-18 (2-4) 18-20 (1-2) 20-00 (0-2) 00-07 (0-1)	07-09 (3) 09-14 (3-1) 14-15 (3-2) 15-16 (3) 16-18 (4) 18-20 (2-4) 20-22 (2-3) 22-00 (2) 00-04 (1-2) 04-07 (1-3)	07-08 (3-2) 08-09 (3-1) 09-14 (1-0) 14-15 (2-0) 15-16 (3-1) 16-17 (4-2) 17-18 (4-3) 18-20 (4) 20-22 (3-4) 22-00 (2-3) 02-04 (2-3) 04-06 (3)
80	08-16 (4) 16-18 (2-4) 18-20 (1-3) 20-06 (1-2) 06-08 (2-3)	08-09 (4-2) 09-16 (4-1) 16-18 (4-2) 18-20 (3-4) 20-06 (2-4) 06-07 (3-4) 07-08 (3)	08-09 (2-1) 09-16 (1-0) 16-18 (2-1) 18-20 (4-3) 20-06 (4) 06-07 (4-2) 07-08 (3-1)	08-09 (1-0) 09-16 (0) 16-18 (1-0) 18-20 (3-2) 20-04 (4-3) 04-06 (4-2) 06-07 (2-1) 07-08 (1)
160	07-09 (3-2) 09-11 (2-0) 11-17 (1-0) 17-19 (3-2) 19-07 (4)	07-09 (2-1) 09-17 (0) 17-19 (2-1) 19-04 (4) 04-06 (4-3) 06-07 (4-2)	06-07 (2-1) 07-09 (1-0) 17-19 (1-0) 19-20 (4-2) 20-21 (4-3) 21-04 (4) 04-06 (3-2)	06-07 (1-0) 07-19 (0) 19-20 (2-1) 20-21 (3-2) 21-04 (4-2) 04-06 (2-1)

Sunset to Midnight: Twenty meters is expected to hang in for an hour or so after sunset to parts of Africa from the EST and CST zones. In PST zone check for long-path openings to Europe and Africa on 20 beginning about 10 p.m. The band looks good to most of Latin America to about 8

HAWAII Openings Given In Hawaiian Standard Time#				
To	15 Meters	20 Meters	40 Meters	80 Meters
Eastern USA	07-08 (1) 08-10 (2) 10-12 (3) 12-13 (2) 13-14 (1)	06-07 (1) 07-09 (2) 09-12 (1) 12-13 (2) 13-14 (3) 14-15 (2) 15-16 (1)	16-18 (1) 18-20 (2) 20-03 (3) 03-04 (2) 04-05 (1)	18-20 (1) 20-01 (2) 01-03 (1) 20-22 (1)* 02-03 (1)*
Central USA	09-11(1)** 07-08 (1) 08-09 (2) 09-12 (3) 12-14 (2) 14-16 (1)	06-07 (1) 07-08 (3) 08-12 (2) 12-15 (4) 15-16 (2) 16-17 (1)	16-18 (1) 18-20 (2) 20-02 (3) 02-04 (2) 14-16 (1)	17-20 (1) 20-02 (3) 02-04 (1) 20-22 (1)* 02-03 (1)*
Western USA	11-14 (1)** 07-09 (1) 09-10 (2) 10-13 (4) 13-14 (2) 14-15 (1)	06-07 (1) 07-08 (2) 08-10 (3) 10-15 (4) 15-16 (3) 16-17 (2) 17-18 (1)	15-17 (1) 17-18 (2) 18-20 (3) 20-02 (4) 02-05 (3) 05-07 (2) 07-08 (1)	17-18 (1) 18-20 (2) 20-04 (4) 04-06 (2) 06-07 (1) 19-02 (1)* 02-04 (2)* 04-06 (1)*

ALASKA Openings Given In GMT #				
To:	15 Meters	20 Meters	40 Meters	80 Meters
Eastern USA	20-22 (1)	19-21 (1) 21-23 (2) 23-00 (1)	00-11 (1) 11-13 (2) 13-14 (1)	07-11 (1)
Central USA	20-22 (1)	17-21 (1) 21-00 (2) 00-01 (1)	01-12 (1) 12-14 (2) 14-15 (1)	07-13 (1)
Western USA	19-21 (1) 21-23 (2) 23-00 (1)	17-19 (1) 19-20 (1) 20-23 (3) 23-01 (2) 01-02 (1)	00-01 (1) 01-02 (2) 02-03 (3) 03-14 (2) 14-16 (3) 16-17 (1)	04-09 (1)* 09-12 (2)* 12-14 (1)*

#See "How To Use Short-Skip Charts" in box at the beginning of this column.  
 Note: The Alaska and Hawaii Propagation Charts are intended for distances greater than 1300 miles. For shorter distances, use the preceding Short-Skip Propagation Chart.  
 \*Indicates best time for 160 meter opening.  
 \*\*Indicates best time for 10 meter opening.

p.m., and to Antarctica and the deep areas of South America almost to midnight. Twenty should remain open to the South Pacific to midnight, and to the Far East and Asia until 10 p.m. in all time zones, but openings favor MST and PST locations. Expect some fairly good open-

ings on 40 meters to Europe and parts of Africa throughout this entire time period, and to most of Latin America as well. In PST zone, check 40 meters for openings towards the South Pacific beginning about 10 p.m. Eighty meters should open toward Europe, Africa, the Caribbean, Central America, and the northern countries of South America during most of this time period. Check for possible 160 meters openings toward the Caribbean area and Central America, and possibly into northern South America, between 10 p.m. and midnight in all time zones. Openings may also be possible on 160 from the EST zone to Europe between 10 p.m. and midnight.

## **VHF Ionospheric Openings**

Two short but significant meteor showers are expected during November, which should make possible some meteor-scatter-type openings on the VHF bands. The *Taurids* shower, occurring during the first week of November, should peak between the 1st and 3rd, with a count of about 15 meteors an hour. A second shower of about the same intensity, called the *Leonids*, should begin on November 14th and peak on the 15th.

Some auroral VHF ionospheric openings should be possible during November, especially when HF conditions are Below Normal or Disturbed as a result of a radio storm. Check the Last Minute Forecast at the beginning of this column for the days that are most likely to be in these categories during November.

## **Sunspot Cycle Progress**

Cycle 21 continues to inch towards its demise. The Royal Observatory of Belgium, the world's official keeper of sunspot data, reports a monthly mean sunspot number of 18 for July 1986. Daily counts varied between 0 and 36. This results in a smoothed sunspot number of 14 centered on January 1986. This is a drop of one unit in the solar cycle from the previous month's level. The 10.7 cm solar flux level for July, as reported by the Algonquin Radio Observatory in Ottawa, Canada, was 70.2. Daily values varied between 66.4 and 72.5.

A smoothed sunspot number of approximately 7 is forecast for November 1986.

Over the past 35 years these WW DX Contest forecasts have sustained an accuracy greater than 90%. Much of this has been due to the excellent propagation data obtained during the contest periods and then fed back into the forecast procedures for subsequent contests. Be sure to let the Editor of this column know how this year's contest propagation forecasts work out.

Good luck in the 1986 CW contest weekend.

73, George, W3ASK

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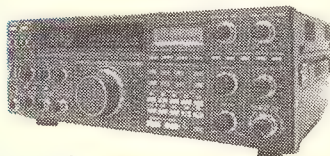
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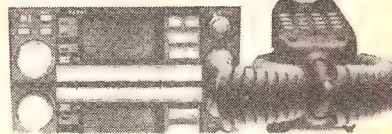
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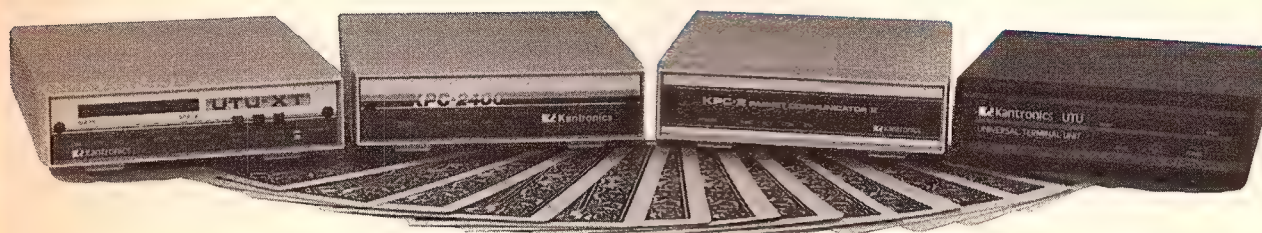
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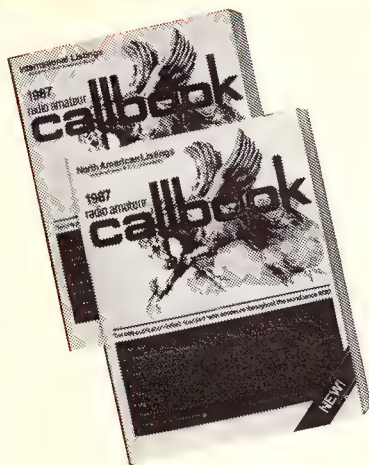
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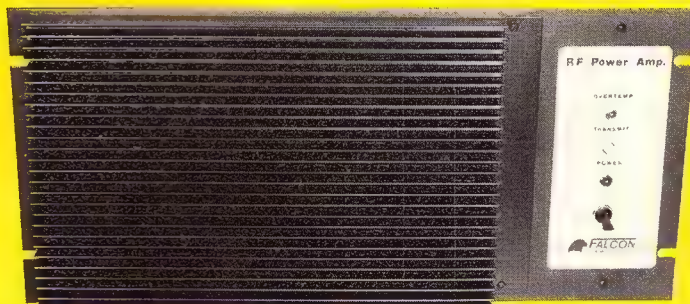
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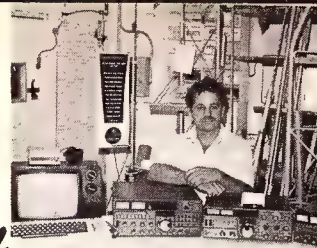
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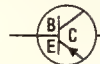
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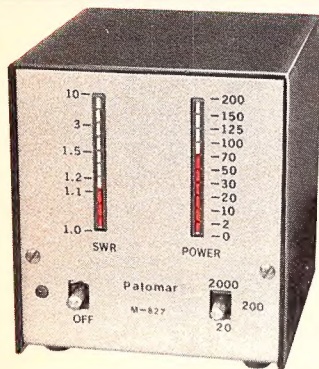


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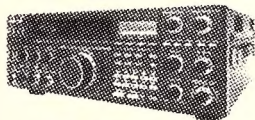
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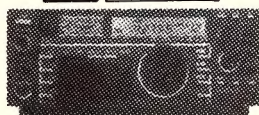


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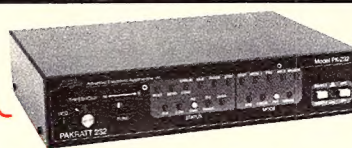
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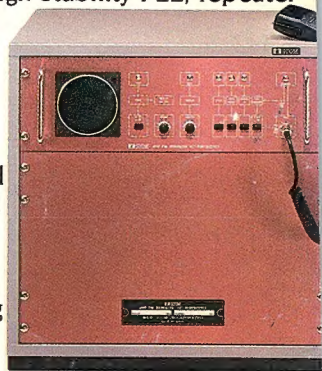
coder/decoder, IC-PS25 internal AC power supply, AG1200 preamplifier and the TV1200 TV interface unit.

TV-1200

**The new IC-12AT** covers from 1260-1299.990MHz, has ten memory channels, memory scan, program scan and programmable offset. It also features an LCD readout, RIT and VXO, 32 built-in tones and a DTMF pad.

**The IC-120** 1.2GHz mobile transceiver has six memory channels, scanning, an HM-14 up/down scanning mic, RIT, LED readout and three tuning rates. Accessories include the ML12 10 watt amplifier and the PS45 slim-line external power supply.

**The IC-RP1210** completes your 1.2GHz system. It features a field programmable (198 channel, DIP switch), high stability PLL, repeater access to CTCSS, three-digit DTMF decoder for control of special functions, 10 watts, selectable hang time and ID'er.



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CIRCLE 155 ON READER SERVICE CARD

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